This guide is a teacher's guide for use in Kindergarten through Grade 2 classrooms.

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Preface

The *Play It Safe With Your Eyes* curriculum is designed to be used by teachers to guide them in the preparation of lessons for educating students on the eye, vision, and how to protect their vision.

The *Play It Safe With Your Eyes* curriculum has been separated into five lesson topics. Each topic contains a lesson objective, lesson content, and key points of discussion. The lesson content provided has been created for the teacher and used by the teacher in customizing lessons to meet their students' specific needs. It is believed teachers know their students best and therefore would best be able to extract and individualize information for their classroom needs. Readings, Web sites, and activities have been outlined to support the lesson content and expand learning opportunities. These activities have been created specifically for children in grades kindergarten through two. A master for duplication has been provided where appropriate.

The curriculum is divided into two main sections: lesson and resources. All lessons are followed by: a reading list, Web resources, and activities. The necessary handouts and overhead materials for each activity are provided immediately following that activity.

RESOURCES

It is anticipated that it would require one full week to cover lessons one through five or the lessons could be conducted over the course of 3 to 4 weeks. Each lesson can also stand on its own. Each lesson would include an overview, an activity, discussion, and follow-up requiring approximately 20 minutes of class time.

A template pre-/post-test has been provided. Each test covers all five lessons. Teachers can use tests and/or questions provided or create their own learning assessment tools.

National Science Education Standards

This curriculum has been developed around the premise of two proficiency standards. First, the Scientific standards of “inquiry” and “ways of knowing.” Second, the National Health Education Standards.

Scientific Inquiry means learning through the process of asking valid questions and gathering and analyzing information.

Scientific Ways of Knowing assumes the current body of scientific knowledge must be based on evidence, be predictive, logical, subject to modification, and limited to the natural world.

Scientific Inquiry	Scientific Ways of Knowing
A. Ask a testable question	A. Recognize that there are different ways to carry out scientific investigations. Realize that investigations can be repeated under the same conditions with similar results and may have different explanations
B. Design & conduct a simple investigation to explore a question	B. Recognize the importance of respect for all living things
C. Gather & communicate information from careful observations and simple investigation through a variety of methods	C. Recognize that diverse groups of people contribute to our understanding of the world.

The National Science Education Standards include seven facets in science education that were developed to improve student learning through the implementation of enlightening activities. The standards addressed in this curriculum are highlighted and noted in this information.

SCIENCE AS INQUIRY

Content Standard A (K-4)

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

PHYSICAL SCIENCE

Content Standard B (K-4)

- Properties of objects and materials
- Position and motion of objects
- Light, heat, electricity, and magnetism

LIFE SCIENCE

Content Standard C (K-4)

- The characteristics of organisms
- Life cycles of organisms
- Organisms and environments

EARTH AND SPACE SCIENCE

Content Standard D (K-4)

- Properties of earth materials
- Objects in the sky
- Changes in earth and sky

SCIENCE AND TECHNOLOGY

Content Standard E (K-4)

- Abilities of technological design
- Understanding about science and technology
- Abilities to distinguish between natural objects and objects made by humans

SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES

Content Standard F (K-4)

- Some objects occur in nature: others have been designed and made by people to solve human problems and enhance the quality of life.
- Objects can be categorized into two groups, natural and designed.

HISTORY AND NATURE OF SCIENCE

Content Standard G (K-4)

- Science as a human endeavor.

Source:
National Research Council – National Science Education Standards

National Health Education Standards

The National Health Education Standards include seven key factors in health education that were developed to improve student learning through curriculum development, instruction, and assessment of student performance. Specific performance indicators define each standard.

HEALTH EDUCATION STANDARD 1:

Students will comprehend concepts related to health promotion and disease prevention.

Rationale

Basic to health education is a foundation of knowledge about the interrelationship of behavior and health, interactions within the human body, and the prevention of diseases and other health problems. Experiencing physical, mental, emotional and social changes as one grows and develops provides a self-contained "learning laboratory." Comprehension of health-promotion strategies and disease prevention concepts enables students to become health-literate, self-directed learners which establishes a foundation for leading healthy and productive lives.

PERFORMANCE INDICATORS:

As a result of health instruction in Grades K-4, students will:

1. Describe relationships between personal health behaviors and individual well being.
2. Identify indicators of mental, emotional, social and physical health during childhood.
3. Describe the basic structure and functions of the human body systems.
4. Describe how the family influences personal health.
5. Describe how physical, social and emotional environments influence personal health.
6. Identify common health problems of children.
7. Identify health problems that should be detected and treated early.
8. Explain how childhood injuries and illnesses can be prevented or treated.

HEALTH EDUCATION STANDARD 2:

Students will demonstrate the ability to access valid health information and health-promoting products and services.

Rationale

Accessing valid health information and health-promoting products and services is important in the prevention, early detection, and treatment of most health problems. Critical thinking involves the ability to identify valid health information and to analyze, select, and access health-promoting services and products. Applying skills of information analysis, organization, comparison, synthesis and evaluation to health issues provides a foundation for individuals to move toward becoming health literate and responsible, productive citizens.

PERFORMANCE INDICATORS:

As a result of health instruction in Grades K-4, students will:

1. Identify characteristics of valid health information and health-promoting products and services.
2. Demonstrate the ability to locate resources from home, school and community that provide valid health information.
3. Explain how media influences the selection of health information, products and services.
4. Demonstrate the ability to locate school and community health helpers.

HEALTH EDUCATION STANDARD 3:

Students will demonstrate the ability to practice health-enhancing behaviors and reduce health risks.

Rationale

By reducing harmful and risk taking behaviors, research confirms that many diseases and injuries can be prevented. More importantly, recognizing and practicing health-enhancing behaviors can contribute to a positive quality of life. Strategies used to maintain and improve positive health behaviors will utilize knowledge and skills that help students become critical thinkers and problem solvers. By accepting responsibility for personal health, students will have a foundation for living a healthy, productive life.

PERFORMANCE INDICATORS:

As a result of health instruction in Grades K-4, students will:

1. Identify responsible health behaviors.
2. Identify personal health needs.
3. Compare behaviors that are safe to those that are risky or harmful.
4. Demonstrate strategies to improve or maintain personal health.
5. Develop injury prevention and management strategies for personal health.
6. Demonstrate ways to avoid and reduce threatening situations.
7. Apply skills to manage stress.

HEALTH EDUCATION STANDARD 4:

Students will analyze the influence of culture, media, technology and other factors on health.

Rationale

Health is influenced by a variety of factors that co-exist within society. These include the cultural context as well as media and technology. A critical thinker and problem solver is able to analyze, evaluate and interpret the influence of these factors on health. The health literate, responsible and productive citizen draws upon the contributions
of culture, media, technology and other factors to strengthen individual, family and community health.

PERFORMANCE INDICATORS:

As a result of health instruction in Grades K-4, students will:

1. Describe how culture influences personal health behaviors.
2. Explain how media influences thoughts, feelings, and health behaviors.
3. Describe ways technology can influence personal health.
4. Explain how information from school and family influences health.

HEALTH EDUCATION STANDARD 5:

Students will demonstrate the ability to use interpersonal communication skills to enhance health.

Rationale

Personal, family, and community health are enhanced through effective communication. A responsible individual will use verbal and non-verbal skills in developing and maintaining healthy personal relationships. Ability to organize and to convey information, beliefs, opinions, and feelings are skills which strengthen interactions and can reduce or avoid conflict. When communicating, individuals who are health literate demonstrate care, consideration, and respect of self and others.

PERFORMANCE INDICATORS:

As a result of health instruction in Grades K-4, students will:

1. Distinguish between verbal and non-verbal communication.
2. Describe characteristics needed to be a responsible friend and family member.
3. Demonstrate healthy ways to express needs, wants, and feelings.
4. Demonstrate ways to communicate care, consideration, and respect of self and others.
5. Demonstrate attentive listening skills to build and maintain healthy relationships.
6. Demonstrate refusal skills to enhance health.
7. Differentiate between negative and positive behaviors used in conflict situations.
8. Demonstrate non-violent strategies to resolve conflicts.

HEALTH EDUCATION STANDARD 6:

Students will demonstrate the ability to use goal-setting and decision-making skills to enhance health.

Rationale

Decision-making and goal setting are essential lifelong skills needed in order to implement and sustain health-enhancing behaviors. These skills make it possible for individuals to transfer health knowledge into healthy lifestyles. When applied to health issues, decision-making and goal-setting skills will enable individuals to collaborate with others to improve the quality of life in their families, schools and communities.

PERFORMANCE INDICATORS:

As a result of health instruction in Grades K-4, students will:

1. Demonstrate the ability to apply a decision-making process to health issues and problems.
2. Explain when to ask for assistance in making health-related decisions and setting health goals.
3. Predict outcomes of positive health decisions.
4. Set a personal health goal and track progress toward its achievement.

HEALTH EDUCATION STANDARD 7:

Students will demonstrate the ability to advocate for personal, family and community health.

Rationale

Quality of life is dependent on an environment that protects and promotes the health of individuals, families, and communities. Advocating and communicating for positive health in their communities characterize responsible citizens, who are health literate. A variety of health advocacy skills are critical to these activities.

PERFORMANCE INDICATORS:

As a result of health instruction in Grades K-4, students will:

1. Describe a variety of methods to convey accurate health information and ideas.
2. Express information and opinions about health issues.
3. Identify community agencies that advocate for healthy individuals, families, and communities.
4. Demonstrate the ability to influence and support others in making positive health choices.

Source:

Joint Committee on National Health Education Standards (1995). National health education standards.

OHIO'S NEW LEARNING STANDARDS: K-12 SCIENCE

The State Board of Education has adopted the more rigorous Ohio Revised Science Content Standards as part of Ohio's suite of College and Career Ready Standards for academic learning. At the core of the revised science standards is science inquiry and application. These components are at the basis of the lessons in each grade level.

K-4 Science Inquiry and Application

During the years of K-4, all students must become proficient in the use of the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Observe and ask questions about the natural environment;
- Plan and conduct simple investigations;
- Employ simple equipment and tools to gather data and extend the senses;
- Use appropriate mathematics with data to construct reasonable explanations;
- Communicate about observations, investigations and explanations; and
- Review and ask questions about the observations and explanations of others.

Below is the overview of the topics that the following lessons can help meet. Content statements that can be addressed during the lesson and activities will be listed at the end of each specific lesson

Grade 3: Life Science (LS)

Topic: Behavior, Growth and Changes

This topic explores life cycles of organisms and the relationship between the natural environment and an organism's (physical and behavioral) traits, which affect its ability to survive and reproduce.

Kindergarten: Life Science (LS)

Topic: Physical & Behavioral Traits of Living Things

This topic focuses on observing, exploring, describing and comparing living things in Ohio.

Kindergarten: Physical Science (PS)

Topic: Properties of Everyday Objects and Materials

This topic focuses on the production of sound and on observing, exploring, describing and comparing the properties of objects and materials with which the student is familiar.

Kindergarten: Earth and Space Sciences (ESS)

Topic: Daily and Seasonal Changes

This topic focuses on observing, exploring, describing and comparing weather changes, patterns in the sky and changing seasons.

Grade 1: Life Science (LS)

Topic: Basic Needs of Living Things

This topic focuses on the physical needs of living things in Ohio. Energy from the sun or food, nutrients, water, shelter and air are some of the physical needs of living things.

Grade 1: Physical Science (PS)

Topic: Motion and Materials

This topic focuses on the changes in properties that occur in objects and materials. Changes of position of an object are a result of pushing or pulling.

Grade 1: Earth and Space Science (ESS)

Topic: Sun, Energy and Weather

This topic focuses on the sun as a source of energy and energy changes that occur to land, air and water.

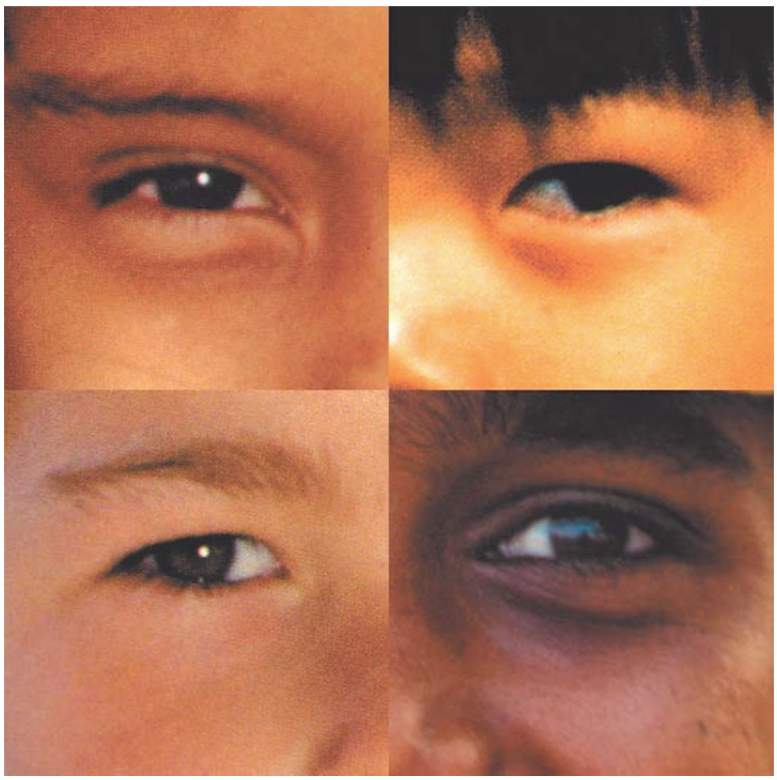
Grade 2: Physical Science (PS)

Topic: Changes in Motion

This topic focuses on observing the relationship between forces and motion.

Source:
The Ohio Department of Education

Play It Safe



With Your Eyes

Lessons

Lesson 1: The Importance of Sight

Six year old Jason takes a good look at his pupils.

Lesson One:

The Importance of Sight emphasizes the role of vision in the realm of the five senses. Although approximately 80% of our learning is acquired through sight, all senses work together to enhance our learning experiences. If we are unable to use our vision, we can still obtain information through our other senses.

The Importance of Sight

Lesson Objective:

- Students will associate the eyes with the ability to see
- Students will be able to tell a friend or adult why good vision is important

Did You Know:

- One in 20 preschool-aged students has vision problems.
- One of every four school-aged students has vision problems.
- Children are frequently unaware they may have vision problems.

Lesson Content:

We have five senses that increase our ability to learn and experience the world we live in.

1. Taste: We use our mouth to taste.
2. Hearing: We use our ears to hear.
3. Smell: We use our nose to smell.
4. Touch: We use our fingers and body to touch.
5. Seeing: We use our eyes to see.

We use our vision to learn about the world around us. Eighty percent of what we learn is through sight. Approximately 75 percent of the school day is spent in visual activities – primarily reading and writing.

Humans were initially hunters, so our eyes enabled us to stalk and kill prey and distinguish one color from another. Today we use our eyes to do things such as read, skate, watch TV, play computer games, etc. Our eyes allow us to see many things: big or small, near or far, smooth or textured, and even colors and dimensions. We have stereoscopic or 3-dimensional vision. Each of our eyes sees from a different point of view. As a result we can determine length, width, and depth. We also have found ways to increase our vision using tools such as magnifying glasses and microscopes.

If you are unable to see an object close up or far away and it appears blurry, or you are having any vision problems, pain, or discomfort in your eyes, please let an adult know.

If left undetected and untreated, vision problems in children can lead to:

- Permanent, uncorrectable loss of vision
- Learning difficulties
- Delayed sensory, motor, cognitive, and social-emotional development

And can negatively impact:

- Athletic performance
- Self-esteem
- Ability to learn
- All aspects of a child's life

Vision disorders are the leading cause(s) of disabling conditions in childhood. The critical period of vision development is up to approximately age 8.

We often take our sight for granted, but we only get one pair of eyes and can't get new ones.

Key Points of Discussion:

- Look around the room and tell me what you can see.
- Close your eyes and tell me what you can see. What can you hear?
- With one eye open and the other closed, look around the room. Is it easier or harder to see with one or both eyes open?
- What do your eyes help you do?
- What movements do your eyes make?
  Open, blink, shut, wink…
- Why are eyes special? **We only get one pair. We can't get new ones. Most of what we learn is through our eyes. They are fragile and tender.**
- How do we communicate with others using our eyes? **Looking, crying, closing eyes…**
- What do we communicate? **Attention, sadness, disrespect…**
- What type of communication are we showing? **Non-verbal**
- Read one of the recommended books in the reading list and discuss how the book relates to the lesson.

National Science Education Standard:
Science and Technology Standard F

National Health Education:
Health Education Standard 1 K-4 (1)

Reading List

- **All the Better to See You With** by Margaret Wild, Albert Whitmore Co., 1993, (for younger children).
  Kate is the small, quiet one in a family of boisterous children. “What big brown eyes you have!” says her mom. “All the better to see you with!” says Kate. But Kate doesn’t know what other people can see and no one thinks to ask her exactly what she sees, until one day on a crowded beach...

- **The Day We Saw the Sun Come Up** by Alice Goudey, Scribner Publishing Company, 1961, (for younger children).
  The children had never in all their lives been outdoors. So early in the morning before their mother and father were up, before the sun itself was even up, they went outside. This is the story of a boy and a girl and a summer day.

- **Let’s Take a Walk in the Zoo** by Jane Belk Moncure, Child’s World, 1986, (for younger children).
  Laura uses her five senses to enjoy her visit to the zoo with her father.

- **My Five Senses** by Aliki, Crowell, 1989, (for younger children).
  A simple presentation of the five senses, demonstrating some ways we use them.

- **Red Thread Riddle** by Jensen/Edman, New York Collins, 1979, (Braille) (for younger children).
  Follow the thread wherever it goes, but use your fingers and not your nose! Follow it and you will find questions and answers, the funny kind.

- **What’s That?** by Virginia Allen Jenses, Collins & World, 1978, (Braille) (for younger children).
  Where has little shaggy gone? Find out by feeling the different shapes and textures of little shaggy and his friends on the pages of this innovative book.

- **First Encyclopedia of the Human Body** by Fiona Chandler, Usborne Publishing Ltd., 2004, (for younger children). Also provides Internet links. See pages 8-9 for information on seeing, lashes, and lids, and eye problems. Great color illustrations.

- **Human Body** by Dr. Sue Davidson, D.K. Publishing, 2002, (for younger children).
  High gloss paper with excellent photos and illustrations. See page 36 for eye illustrations.

Web Resources

Vision and the Eye:

American Ophthalmology Association Site with an Interactive Eye Illustration, Activity Sheets, and Lessons Plans:
http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=TeachersCenter

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=ActivitySheet5

Glossary of Terms
http://www.tedmontgomery.com/the_eye/glossary/A.html

Prevent Blindness America
http://www.preventblindness.org

Vision Learning Activities:

American Optometric Association Activity Sheets:

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=ActivitySheet1

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=ActivitySheet2

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=ActivitySheet3

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=ActivitySheet4

Exploratorium of Activities:

http://www.exploratorium.edu/snacks/
(See Science Snacks)

Vision Experiments and Activities for Children: Neuroscience for Kids:
http://faculty.washington.edu/chudler/neurok.html
(go to Explore the nervous system, then to Sensory systems)

Additional Downloadable Resources:

Vision: A School Program for Grades 4-8
National Eye Institute http://www.nei.nih.gov/education/visionschool/index.asp

Wild About Healthy Vision: Activity Book for Ages 9-12

See All You Can See: Activity Book for Ages 6-8
US Dept. of Health and Human Services
National Institute of Health
National Eye Institute http://www.nei.nih.gov/order/pub_sorted_by_title.asp

Other:

National Library of Medicine: Genetics Home Reference:
http://ghr.nlm.nih.gov/ghr/page/Home

Information on Health and the Body for Parents, Kids, and Teens:
http://www.kidshealth.org/

Mystery Jars

Objectives:

- Students will identify different scents using only their sense of smell.
- Students will begin to understand how difficult it is to use an alternative sense if they were unable to use their vision.

Did You Know:

- Smells are mixed in with the air around you. To identify smells, you breathe or smell in air to move past smell detectors in the upper part of your nose.
- Snakes smell with their tongues.

Materials:

- Cotton balls
- Various extracts (lemon, peppermint, maple, orange, banana, etc.)
- Film canisters or other small containers with lids
- Paper
- Pencil

Precautions:

- Use care when implementing this activity, especially with students prone to asthma and allergies. Oils, such as cinnamon, also may cause rashes.

Activity Instructions:

1. Pour extract onto a cotton ball.
2. Place cotton ball in container, continue to do this until you have at least 5-6 different containers and scents.
3. Use a sharp object to poke a small hole on the top of the lid and place on film canister.
4. Number each canister.
5. Make a key of each scent with corresponding number (e.g. 1- lemon, 2- orange).
6. Have students smell each container and write down the number and which scent they think they smell for each container.

Discussion:

- Were any of the scents harder to detect than others?
- Did it get more difficult after each smell to determine the smell? (Smell detector overload)
- What problems could arise if you no longer had the sense of smell? (e.g. couldn't smell if something was burning, couldn't smell if food was bad)
- Do you think food would taste differently if you could no longer smell it?
- Would it be easier to identify the scent if you could see the color of the extract?

Sound Recognition

Objectives:

- Students will identify sounds without seeing the object.
- Students will learn how sound can warn us of danger.

Did You Know:

- Sound travels in waves.
- Ears change sound into signals that are sent to your brain.
- Your brain translates these signals into the sounds you hear.

Materials:

- Musical instruments (sticks, bells, tambourine, drums, etc.)
- Tape of sounds (sirens, cry for help, fire bell, etc.)
- Tape recorder
- Box or board
- Paper and pencil for graph

Activity Instructions:

1. Graph of different sounds
2. Hide objects (that produce sound) behind a box or board
3. Next students will try and guess the object that makes each sound
4. Mark off answers on graph
5. Go over correct and incorrect results on graph

Discussion:

- Were any of these sounds harder to tell apart than others?
- How does our sense of hearing help keep us out of danger or save someone else from danger?
- Do you think it would be harder to detect where a sound was coming from with hearing loss to only one ear? (Experiment - have students close their eyes and cover one ear, while another group walks around room making noise, have the first group of students point to the direction of sound).
- How do your senses work together? If one sense is missing do the others help to make up for the missing sense?

Activity Extensions:

- Play different types of music and have students draw while listening to the music - discuss the colors students chose for the different styles of music
- Use a tuning fork and pan of water to observe sound; test various items to see how they vibrate.

Eye Color Chart

Objectives:

- Students will learn how to chart and graph using collected data.
- Students will predict study results.

Did You Know:

- The exact color of the eye is determined by the amount of pigment called melanin that is present in the iris of the eye.

- The more melanin that is deposited in the iris, the darker the eye color.

Materials:

- Paper
- Eye color graph (hand made)
- Markers (black, gray, brown, green, blue)
- Small mirrors

Activity Instructions:

1. Students will predict which eye color they think will be found most often in a classroom.
2. Have students look into mirrors to determine eye color.
3. On a piece of paper, have students write their names and draw a circle. Have them color the circle the color of their own eyes.
4. Students will then turn in findings to teacher.
5. Have students help count and categorize colors.
6. Chart the results on a graph.

Discussion:

- Was your classroom prediction of eye color right?
- If you visited another classroom, do you think the results would be the same or different?
- Do you think the results would be the same or different, if we only charted boys/girls?

Additional Activity Suggestions

- Play games that emphasize the importance of seeing and not being able to see, such as “Peek a boo,” “Hide and Seek,” or “I Spy.”

- Have students cut out pictures of items from magazines that require the use of each of the 5 senses.

Lesson Two: The Eye and How We See

Mandy magnifies her view of the world.

Lesson Two:

The Eye and How We See provides a structure of the eye and how the parts of the eye work together to allow us to see. The parts of the eye and the functions of each are outlined. Human and animal vision is discussed.

The Eye and How We See

Key Vocabulary:

Eyelid
Eyebrow
Eyelashes
Light
Pupil
Lens
Iris
Retina
Rods
Cones
Fovea
Optic nerve
Optic chiasm
Visual cortex
Brain
Cornea
Aqueous humor
Choroid
Ciliary Body
Conjunctiva
Crystalline lens
Extraocular muscles
Macula
Optic nerve
Retinal blood vessels
Sclera
Vitreous humor
Similarity
Proximity
Continuity
Closure
Predator
Prey
Nocturnal
Aquatic
Tapetum lucidum
Compound

Lesson Objective:

- The students will recognize the terms used for parts of the eye.
- Children will name or point to parts of the eye;
- Children will be able to describe how the eye works.

Did You Know:

- Each eye weighs 1/4 ounce.
- The eye measures less than 1 inch in diameter.
- During a blink, the eye is closed 0.3 seconds. This equates to 30 minutes each day.
- One in every 12 males is color blind.
- The eye continuously makes small jittery movements.
- When people have red eyes in photographs, it is because of the light that reflects off the blood vessels of the retina.
- Rods help in seeing shape and movement. Cones combine the three main colors – red, blue, and green.
- The American Woodcock could see all bases, the home plate, the entire outfield, the entire stadium, and an overhead dome from the pitcher's mound without moving its head.
- Some bats have poor eyesight and use their hearing to track insects and avoid obstacles
- Alligators and most birds have three eyelids.
- Eagles can see a mouse one mile away.
- Earthworms are blind.
- Jumping spiders have eight eyes.
- Owl eyes fill over half of its skull, and an owl can rotate its neck 270 degrees.
- Flying insects can see up to 360 images a second during daylight, whereas the human eye processes approximately 60.
- Fish sleep with their eyes open.
- Starfish eyes are on its feet.
- Some worms have more than 100 eyes.

LESSON CONTENT

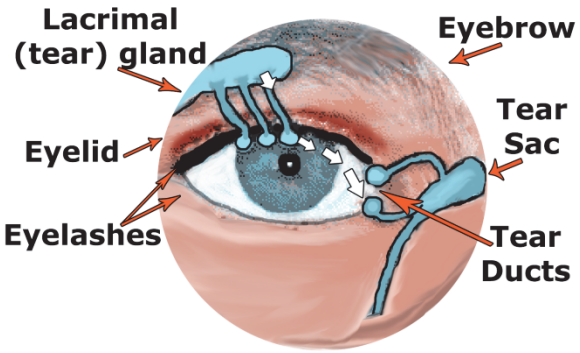
The Eye:

The eye is a complete optical system slightly smaller than a ping-pong ball. The eye transforms light into the images that we see. Our eyes work as "live cameras" for the brain, gathering up and processing images far better than any high-tech device.

Because the eye is so complex, defects are bound to occur. It is estimated that as many as 90 percent of us have at least slightly imperfect eyesight. About 60 percent of us need corrective lenses sometimes, if not all of the time. The need for corrective
lenses after mid-life is nearly universal. Only a few enjoy perfect vision without correction throughout life.

The Eye's Natural Protection:
The parts of our eye that we are most familiar with include the eyelid, eyebrow, and eyelashes. All of these parts of the eye help to protect your eyes. We also wear hats with visors and sunglasses and goggles to protect our eyes. (We'll talk about that more later.)

The **eyebrows** help to shade our eyes. They also help to keep sweat and debris from falling into our eyes.



Eyelids move up and down over our eyes like a window shade. They sweep dirt away when you blink and help spread tears. They help protect our eyes by automatically closing when an object gets too close to our eyes. Eyelids keep the light out when we sleep.

Blinking helps to lubricate the eyes with a fresh coating of tears. These tears contain bacteria-killing enzymes that protect our eyes from infection. We blink every 2 to 10 seconds. During a blink we keep our eyes shut for approximately 0.3 seconds, a total of 30 minutes a day.

Eyelashes are the tiny row of hairs along the top and lower eyelids. Each eye has approximately 100-150 eyelashes on the upper eyelid and 50-70 on the lower lid. Eyelashes help keep dust and dirt, sweat, water, and other irritants from getting into our eyes.
Tears not only roll down our faces, but tear ducts drain tears from our eyes. Tears draining through tear ducts ultimately drain through our nose. This is why we often need to blow our nose when our eyes tear up or we cry.

The Eye Ball:
The eye rests in bony sockets that protect the eye against impact.

The human eye is an opaque ball with a transparent bulge providing a clear "window" at its front side. It is about an inch in diameter and weighs just a quarter of an ounce. Within the eye is an intricate arrangement of tissues, fluids, nerves, and cells.

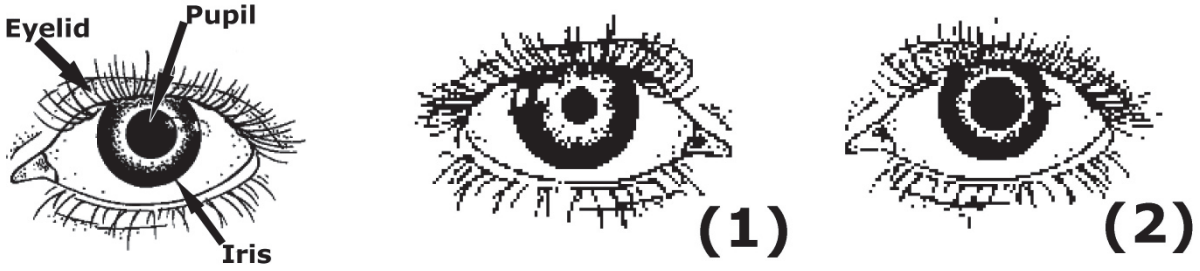
Light:
Light is the only thing we can really see. It comes to us in the form of a combination of magnetic and electrical energy traveling at very high speeds. Light is composed of small particles of energy called photons. Light travels in waves that progress as straight lines. The light waves bounce or bend as they travel. The result is reflection or refraction. Different wavelengths produce different colors. Without light, color would not be possible.

Visual light is the combination of seven wavelengths. We cannot see these wavelengths separately, but instead see a combination of the seven that represent white light. The more sensitive the eye is to varying sizes of wavelengths, the more colors can be seen. Visible light, that can be seen by the human eye, ranges between ultraviolet and infrared. They include (from shortest to longest wavelength): violet, indigo, blue, green, yellow, orange, and red. These seven colors are represented in the rainbow. The rain has separated the colors for us to see all seven. These colors also can be seen by shining white light through a glass prism. It is estimated that the human eye can see as many as 150 different hues or shades of color. The color seen depends on the wavelengths the eye can absorb and how you perceive it.

The ability to view an object is dependent upon the light source. As the source is changed, so is the view of the object.

The Visual Process:
Light bounces off of objects and enters the eye through a hole in the eye called the **pupil**. The light then passes through a clear, curved structure called the **lens**. The lens bends the light to focus the image on the back section of the eye called the retina. Nerves send the image from the retina to the brain. You see the object when the image reaches the brain. The brain tells us what we see.

The pupil is the hole in the middle of your eye that looks like a black spot. It can change sizes depending on how much light it needs to see. It gets larger when you are in a dark place to let more light enter and it gets smaller when you are in a sunny place to let only the right amount of light enter. The **iris** is the colored part of the eye that surrounds the pupil.



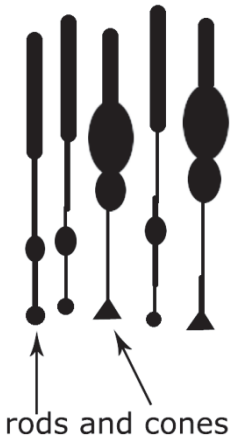
A close up view of the pupil and iris.

The iris is where eye color is determined. The color of the connective tissue and pigment cells determine eye color. More pigment results in brown eyes, whereas, less pigment results in blue eyes. The iris also controls the amount of light that enters the eye. More light is allowed to enter when conditions are dim and less light in bright environments. However, too much light can damage the eyes. The muscles of the iris widen or narrow to change the pupil size regulating the amount of light that can enter the eye. The dilator muscle makes the iris smaller, the pupil becomes larger, and more light can enter the eye. The sphincter muscle makes the iris larger, the pupil smaller, and less light can enter the eye.

The **retina** is made up of many layers, the innermost layer contains nerve cells called rods and cones. **Rods** are responsible for black and white vision in low light conditions. There are approximately 125 million rods on the surface of the retina. The rods contain rhodopsin, a substance that gathers electrical signals and sends them to nerve cells in the retina. Rhodopsin requires Vitamin A for replenishment. A deficiency in Vitamin A can result in night blindness. **Cones** are responsible for detail and color vision in bright light. Approximately 5-7 million cones are on the top layer of the retina. Three different kinds of cones exist in order to detect varying types of light (color):

1. Blues and violets have short wavelengths.
2. Yellows and greens have medium length wavelength.
3. Reds have long wavelengths.

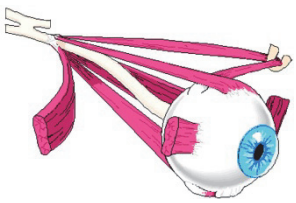
The majority of cones are located in the middle of the retina at the **fovea**. The spot where your nerves join to form the **optic nerve** does not have rods or cones and is the blind spot.



The **macula** is in the back of the eye at the center of the retina. In the center of the macula is the fovea, which is responsible for fine detail and therefore only contains cones.

Information travels through the **optic chiasm** to the **visual cortex**. The optic nerves on the right side of the optic chiasm carry information from the right side of each eye's retina and the left from the left side of each eye's retina. The signals sent to the visual cortex are combined to form the complete image and the new image is compared to images stored in memory. Higher areas of the cortex process signals for shape, color, or motion.

Eye Movement:



The six eye muscles.

Our eyes move within our eye sockets (or orbits). Eye movement is controlled by six eye muscles:

- Lateral rectus: outward movements
- Medial rectus: inward movements
- Superior rectus: upward movements
- Superior oblique: downward and outward movements
- Inferior oblique: upward and outward movements
- Inferior rectus: downward movements

The muscles work in pairs of three to pull the eye in the direction necessary. The muscles cannot push the eye in any direction. In addition, movement is limited because of the optic nerve connected to the back of the eye.

The **brain** ultimately controls eye movement as it sends signals to the eyes' muscles to make adjustments. The brain also directs the involuntary movements of our eyes. Our eyes are constantly moving. Even when staring at an object, our eyes tremble slightly so that the same cells are not constantly exposed to the light. This trembling also enables our eyes to fill in our blind spot so we do not see a black spot.

The Eye and the Camera:

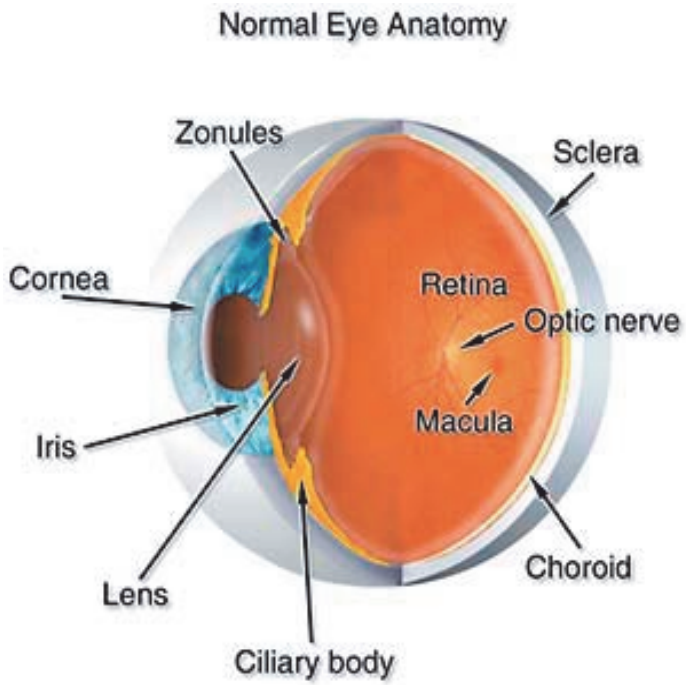
As mentioned previously, the process of seeing is often compared to taking pictures with a camera. The photograph is the concrete record of what the eyes see. The retina acts like a camera's film, converting light into a form that can be made into pictures. "Film processing" is accomplished in the brain—at a pace much faster than any high-tech photo lab. The eye and the camera have a basic fact in common: a good finished image requires precision-made parts that are well aligned. In both cases, light rays reflected from objects within view are gathered up, focused and converted into images.

Primary mechanical parts of the eye and the camera are particularly comparable. The **cornea** and **crystalline lens** work together to provide focusing power similar to that of a camera lens. The iris operates as a diaphragm, reacting to brightness or darkness of incoming light. The iris uses settings like those made to change a camera's shutter speed. The crystalline lens flexes to sharpen the focus comparable to adjusting a camera lens backward and forward. The retina converts light into a form that can be made into pictures, like a camera's film. The processing of the film occurs in the brain. Refraction is critical to the quality of the final image in both vision and photography.

Order of Visual Functioning	Layers of the Eye
1	Cornea
2	Pupil
3	Iris
4	Aqueous Humor
5	Crystalline Lens
6	Vitrious Humor
7	Retia
8	Macula
9	Optic Nerve
10	Brain

The order of visual functioning by layer. When light enters our eyes, an image is formed in our brain. Light passes through the cornea, pupil, aqueous humor, lens, and vitreous humor, before reaching the retina. An inverted image of the object is projected on the retina. The retina changes the light rays into signals it sends to the brain.

Normal Eye Anatomy:

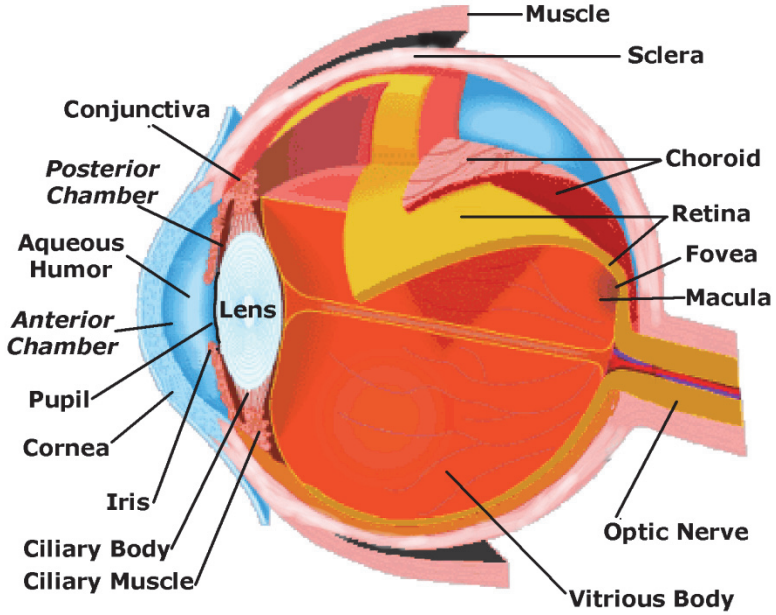


The eyeball with labeled anatomy.

Parts of the Eye:

Aqueous Humor is the water-like fluid filling the space behind the cornea and in front of the crystalline lens (the anterior chamber). It is produced by the ciliary body and drains back into the blood circulation through channels in the chamber angle. Its main function is to provide nutrients to the front portion of the eyeball.

Choroid is the middle layer of the eyeball's casing, positioned between the sclera and retina. It supplies most of the retina's nourishment and has one of the highest blood flows in the body.



A second schematic of the eye with parts identified.

Ciliary Body is the extension of the choroid, connecting with the iris. It produces the aqueous humor and contains the muscle system that controls the flexing of the crystalline lens. The ciliary body is connected to the lens by fine fibers called zonules.

Conjunctiva is the membrane lining the inside of the eyelids and the sclera (white part of the eye). It firmly attaches the eyeball to the eyelid and eye socket, but it is flexible enough to permit us to move our eyes up and down and side to side. The conjunctiva protects the eye from foreign particles and some viruses and bacteria.

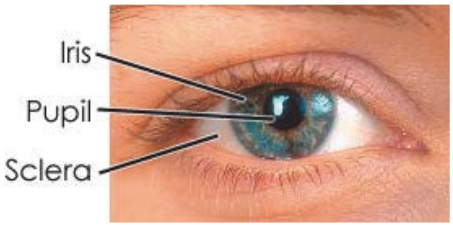
Cornea is the clear, dome-shaped “front window” of the eye. The cornea is a lens that bends (refracts) light rays as they pass through. The curvature of the cornea accomplishes about 80 percent of the focusing of the eye.

Crystalline Lens is the transparent tissue that acts like a magnifying glass behind the pupil. The crystalline lens fl exes when we want to look at something close-up, providing about 30 percent of the eyes’ total focusing power. The growth and hardening of the lens causes it to lose its flexibility over time, which is why people 45 and older usually need bifocal contacts or glasses, or reading glasses.

Extraocular Muscles consist of six separate muscles that control eye movement. Five of these muscles originate from the back of the orbit and wrap around the eye to attach within millimeters of the cornea. Four of these muscles move the eye roughly
up, down, left, and right. Two of these muscles, one of which originates from the lower rim of the orbit, control the twisting motion of the eye when the head is tilted.

Eyelid serves multiple functions. Reflex closure of the eyelids will keep objects out of the eye and lubricate the cornea by distributing fresh tears.

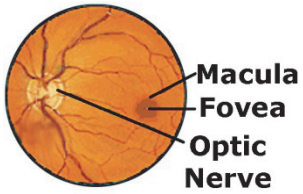
Iris is the doughnut-shaped ring of pigmented tissue that determines an eye's color. The iris opens and closes to control the amount of entering light.



A close up view of the eye.

Lens is the clear part of the eye behind the iris. Helps to focus light on the retina and focus on far and near objects.

Macula is the area in the middle of the retina responsible for distinguishing fine details and colors. At its center is the fovea, a tiny pit containing the highest concentration of cones and providing the ultimate focal point for the optical system.

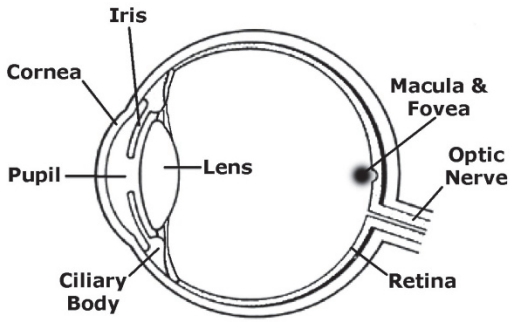


The interior of a healthy eye.

Optic Nerve contains visual information from the eye and has 1.2 million nerve fibers that carry impulses from the retina to the brain. The sheath around the optic nerve is continuous with that of the brain and the nerve connects directly into the brain.

Pupil is the hole in the center of the iris that appears black. In dim light, the iris enlarges the pupil, increasing the amount of light entering the eye and improving vision. In bright light, the iris reduces the pupil's size to decrease entering light and avoid eye damage. The pupil looks black because it is very dark inside – that is, almost no light is reflected back out.

Retina is a layer of light-sensitive nerve cells lining much of the inside of the eyeball. The retina contains receptor cells called rods and cones that convert light into electro-chemical impulses sent to the brain. Rods aid vision in dim light, while cones help with color perception.



Detailed outline of the parts of the eye.

Retinal Blood Vessels supply oxygen to the inner lining of the eye (retina).

Sclera is the "white of the eye." Along with the cornea, it forms a tough protective coating. The sclera continues back over the optic nerve to join with the outer covering of the brain.

Vitreous Humor is the clear, jelly-like substance filling the otherwise empty space behind the crystalline lens. It serves primarily to keep the retina pressed against the inside wall of the eyeball. It tends to liquefy with age.

The Eye and The Brain:
Our eyes and our brain are responsible for taking in and interpreting images. Visually we take in a tremendous amount of information. It is our brain that must sort the information in order of importance and make sense of what we see. The brain makes educated guesses from the information by using simple assumptions. The brain wants to create a single interpretation of an image that we recognize by grouping the information received. The final image is constructed unconsciously and quickly.

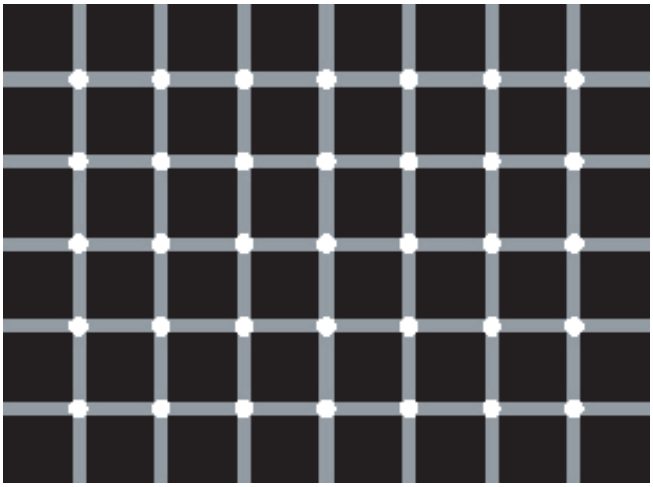
Optical Illusions:
Our eyes and brain, however, can play tricks on us. Some images won't let our brain create a single interpretation. Our brain groups the information we see in four ways.

1. Similarity: we will group dots of a similar color together to form shapes.
2. Proximity: when items are placed close together, we will see them different from if they were equally spaced.
3. Continuity: although dots might appear random on a page, our brain will group the dots together to see a pattern.
4. Closure: our brain will fill in gaps to form objects that are familiar.

Not only is our vision affected in this way, but also we can hear things that aren't really there.

We see in three dimensions. We use clues of depth, shading, lighting, and position to interpret 3-dimensional images. In 2- dimensional images when such information is absent, our brains use the rules of perception described above.

When people see spots that do not exist it is because light responds differently to light and dark areas. The eye compensates by turning down brightness of an area surrounded by light. This creates the appearance of darkened spots as in the image below.



Optical illusion of lines and dots.

Tools:
Humans have invented machines to compensate for visual drawbacks. Microscopes bend light rays to enlarge or magnify an image. Stop-action photography and slow-motion movies enable us to slow down the movement of fast moving objects so that we can study them. Satellites give us a new perspective of not only the world we live in, but space.

Animal Eyes:
Human eyes are weak in comparison to some animals. Some animals see similar to humans, using binocular vision. Some animals can see more color, some do not see color, some have more than two eyes, and others have their best vision at night. The location of animals' eyes are often due to a need of that classification. Animals and their vision can be classified as: predator, prey, nocturnal, aquatic, or insect.

Predators:
Predators have 3-dimensional vision resulting from two slightly different views, one from each eye (binocular vision). The vision of a predator is the most like human sight. Each of our eyes sees a slightly different picture. Our brain "overlaps" the images to create one scene. This allows for excellent depth and clarity of vision. Animals with binocular vision tend to be predators. Some examples are dogs, wolves, hawks, and falcons.

Prey:
Prey animals have a wide field of vision because of the placement of their eyes; their eyes are on the sides of their head. Most prey animals have large eyes. These allow for a broad range of vision and detection of movement, but their vision lacks definition. They have fewer cones, for

color vision, and more rods for sensitivity to light. Prey animals include rabbits, mice, and antelope.

Nocturnal:
Most **nocturnal** animals have eyes that are well adapted to seeing at night. Nocturnal animals have very large eyes for admitting lots of light; they have more rods than cones and often no cones at all. Most nocturnal animals also have a layer behind the retina called the tapetum lucidum. This reflective layer of tissue acts like a mirror by reflecting light that enters the eye back into the eye. The tapetum lucidum allows more light to hit the retina, enabling the animal to see better in low light conditions. Cats, dogs, owls, and raccoons are nocturnal animals.

Aquatic:
The eyes of **aquatic** animals are adapted for seeing through a medium other than air. Aquatic animals do not have eyelids or tear ducts because they live in a watery environment. They don't need to worry about their eyes drying out. Aquatic animals also don't have ciliary bodies (tiny projections that secret fluid to keep our eyeballs from drying out and collapsing). Instead, the eyes of aquatic animals absorb water directly through the cornea; that's what keeps the eyeball's shape. Aquatic animals' eyes also are especially sensitive to blue light, because that is the color that most deeply penetrates the water. Aquatic animals include: fish, crabs, and sharks.

Insects:
Insects have **compound** eyes. Compound eyes are made up of many separate units called ommatidia. Each ommatidium has its own lens, cone, pigment cells, and retinal cells. Each one works like a miniature eye. These eyes form many images and allow for a very short range of vision. What the vision lacks in depth it makes up for through very broad range. The near-sightedness of insects is so extreme that they see detail where we would need a microscope to see. However, the insect cannot change focus, but is required to move closer or further away from the object. The fly, horsefly, and mosquito have compound eyes. Insects also can have single lens eyes and more than two. Ladybugs have 9 or 10 eyes, whereas, the bee and dragonfly have many thousands of eyes.

There are other specialized animal eyes worth mentioning. For instance, the chameleon can look in opposite directions at the same time; crabs and crayfish have eyes on stalks that can be moved around to look 360 degrees; some insects (like the bee) can see polarized light; and some animals (like the fish, "four eyes") have eyes that are split in half (one half sees above water and the other half sees under water).

Plants and Vision:
Although plants do not have eyes, they are described as seeing. For example, sunflowers twist on their stems towards the direction of light. They do not have true eyes, but instead have photo receptor cells.

Key Points of Discussion:

- In which direction do you see best? Straight ahead or to the side?
  We see best when we look straight ahead because our eyes work together.
- Can you see more by moving just your eyes up, down, left, and right?
- How much more can you see when you move your head as well as your eyes?
- What are some parts of the eye? **Eyelid, eyebrow, eyelash, pupil, iris…**
- How does the pupil work? **The pupils control the amount of light that goes into our eyes.**
- Read one of the books from the reading list and discuss how the book relates to the lesson.

National Science Education Standards

Science as Inquiry Standard A (K-4)
Physical Science Standard B (K-4)
Life Science Standard C (K-4)

National Health Education Standard
Standard 1: K-4 (3)

Ohio's New Learning Standards: K-12 Science:
Grade 1: Physical Science (PS)
Properties of objects and materials can change.
Objects can be moved in a variety of ways, such as straight, zigzag, circular and back and forth.

Grade 2: Physical Science (PS)
Forces change the motion of an object.

Reading List

- **It Looked Like Spilled Milk** by Charles Shaw, Harper & Row, 1988, (for younger children). Sometimes it looked like spilled milk, but it wasn't spilled milk. Sometimes it looked like other things, but it wasn't. What was it?

- **Seeing Things** by Alan Fowler, Children's Press, 1991, (for preschoolers). Discusses the parts of the eye and how this organ works to give us our view of the world.

- **Eye Wonder**. Human Body by Caroline Bingham, DK Publishing, Inc. 2003, (for younger children). A good educational start with excellent photography. See pages 34-35 for Eye, Eye.

Web Resources

Vision and the Eye:

An Interactive Introduction to the Eye: 1-800 CONTACTS Vision 101:
http://www.1800contacts.com/vision101

American Ophthalmology Association Site with an Interactive Eye Illustration, Activity Sheets, and Lessons Plans:

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=TeachersCenter

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=ActivitySheet1

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=ActivitySheet2

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=ActivitySheet3

How Vision Works:
http://www.howstuffworks.com/eye.htm

Glossary of Terms:
http://www.tedmontgomery.com/the_eye/glossary/A.html

Prevent Blindness America:
http://www.preventblindness.org

Vision Learning Activities:

Realeyes: The Ohio Optometric Association's Education Initiative (for students (by grade level), teachers, and parents):
http://ooa.org/Intro.html

Exploratorium of Activities: http://www.exploratorium.edu/snacks/
(See Science Snacks)

Vision Experiments and Activities for Children: Neuroscience for Kids:
http://faculty.washington.edu/chudler/chvision.html
http://faculty.washington.edu/chudler/neurok.html
(go to Explore the nervous system, then to Sensory systems)

Animal Eyes:

http://ebiomedia.com/gall/eyes/

Eye, Eye, Eye, Eye, Questions about Eyes:
http://ebiomedia.com/gall/eyes/eye1.html

Eye to Eye AWLS (Annotated Web Link Site):
http://ebiomedia.com/gall/eyes/EyeAWLS.html

Forest Preserve District of Cook County (Illinois): Nature Bulletins: Eyes of file:///Animals/
http///www.newton.dep.anl.gov/natbltn/natbltn.htm (go to 403)

ThinkQuest: Sighting the First Sense: Seeing is Believing http://library.thinkquest.org/C001464/cgi-bin/main.cgi?

Optical Illusions:

http://www.justriddlesandmore.com/illusion.html
http://www.sandlotscience.com
http://www.eyetricks.com
http://www.optillusions.com/

Additional Downloadable Resources:

Vision: A School Program for Grades 4-8
National Eye Institute
http://www.nei.nih.gov/education/visionschool/index.asp

Wild About Healthy Vision: Activity Book for Ages 9-12
See All You Can See: Activity Book for Ages 6-8
US Dept. of Health and Human Services
National Institute of Health
National Eye Institute
http://www.nei.nih.gov/order/pub_sorted_by_title.asp

Other:

National Library of Medicine: Genetics Home Reference:
http://ghr.nlm.nih.gov/ghr/page/Home

Information on Health and the Body for Parents, Kids, and Teens:
http://www.kidshealth.org/

Medical Library with Information on Eye Health:
http://www.medem.com/MedLB/sub_detaillb.cfm?parent_id=30&act=disp.cfm

Pirate Toss

Objectives:

- Students will experiment with monocular vision.

Did You Know:

- Monocular vision is the loss of sight in only one eye. The main problem with monocular vision is the loss or reduction (10-20%) of peripheral vision (side vision).

Materials:

- Eye patch or eye cover
- Ball (Caution: use a large, foam ball like a Nerf ball)
- Pairs of students

Activity Instructions:

1. Have each student cover or patch one eye.
2. Let the students take turns passing a ball to one another.
3. Have students count how many catches were made.
4. Have students repeat activity without the patch and count how many catches were made.

Discussion:

- How many catches were made with monocular vision compared to full vision?
- Do you think you would be able to ride a bike or skate safely with sight in only one eye?
- How does having peripheral vision help us?

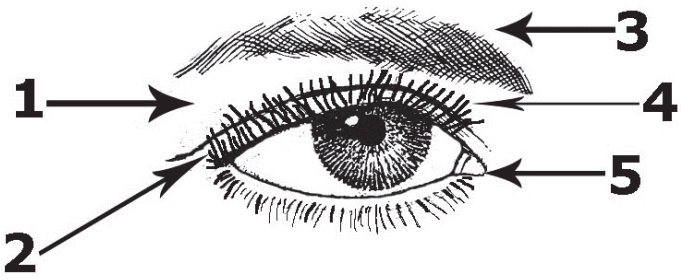
Activity Extension:

- Use toilet paper tubes and paper towel tubes of differing lengths.
- Graph results.

Eye Parts

Objective:

- Students will correctly identify the parts of the eye.



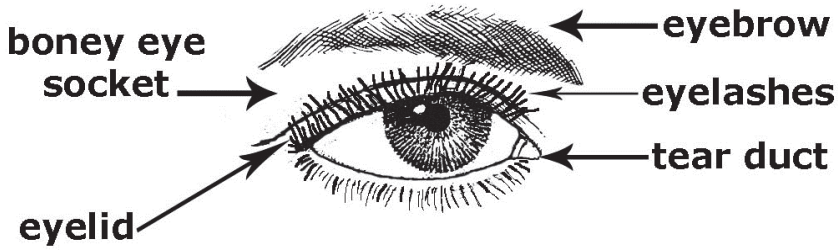
Terms:

Use the following terms to identify the parts of the eye above.

bony eye socket **eyebrow**
eyelashes **eyelid**
tear duct

Answers:

1. boney eye socket
2. eyelid
3. eyebrow
4. eyelashes
5. tear ducts



Science Ed Standard Science as Inquiry
Standard A (K-4)
Standard B (K-4)
Standard C (K-4)

Name: _____

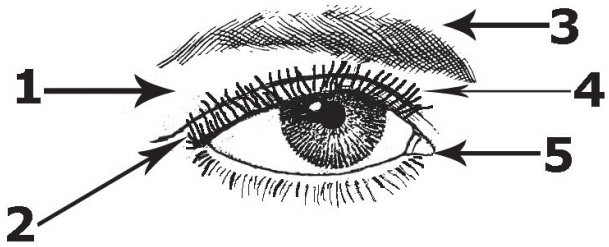
Teacher: _____

Class: _____

Date: _____

Eye Parts

Correctly identify the parts of the eye.

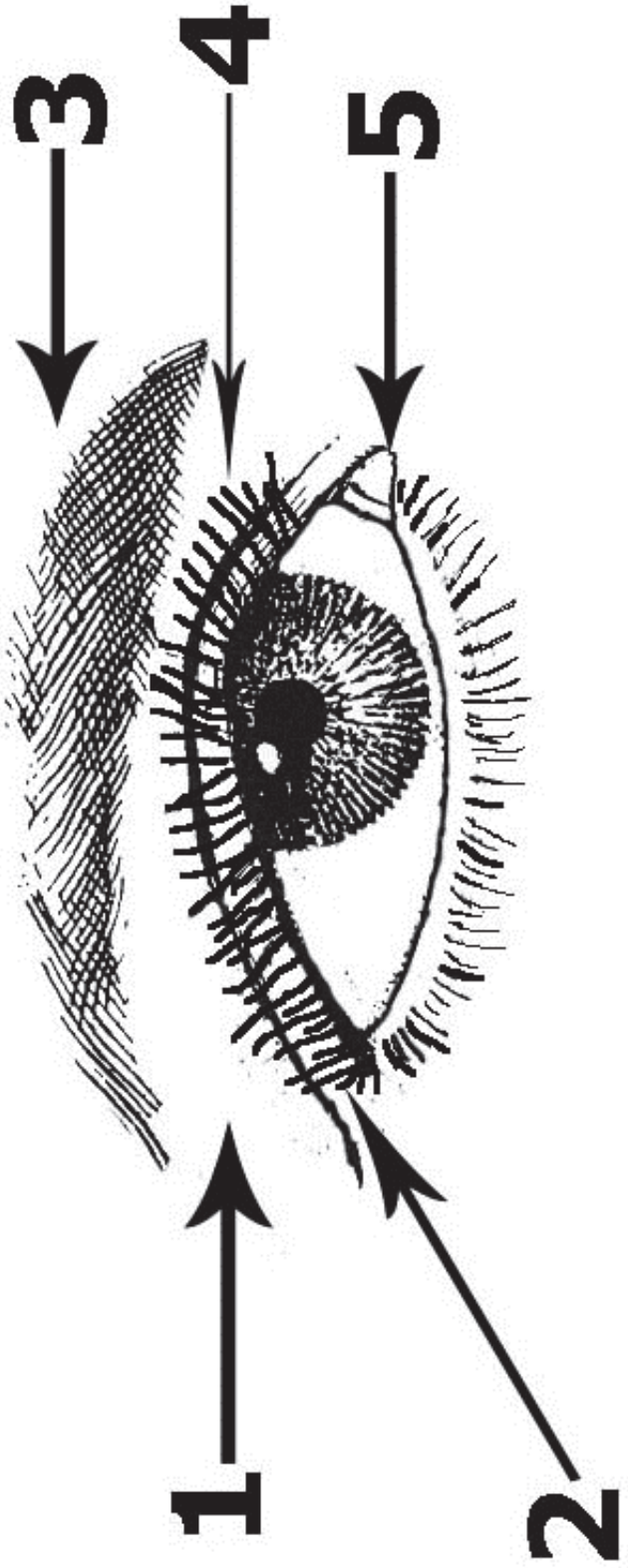


Use the following terms to identify the parts of the eye above.

boney eye socket
eyebrow
eyelashes
eyelid
tear duct

Answers:

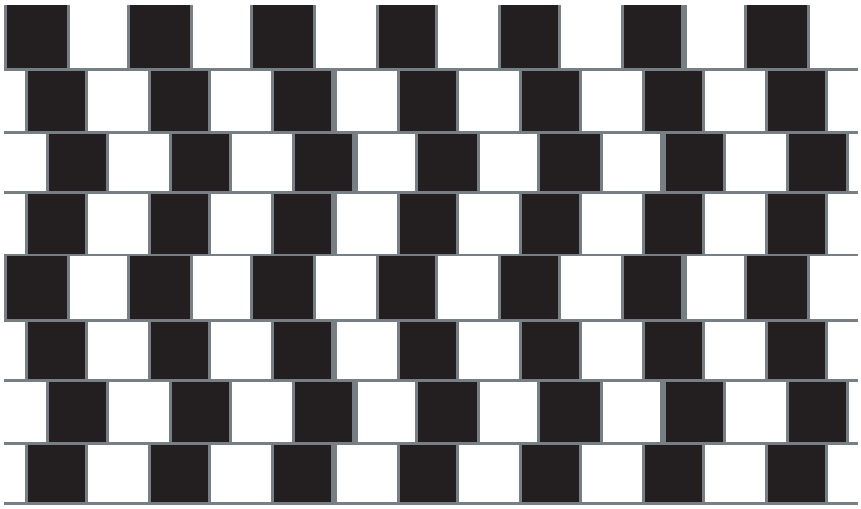
1. _____
2. _____
3. _____
4. _____
5. _____



Optical Illusions

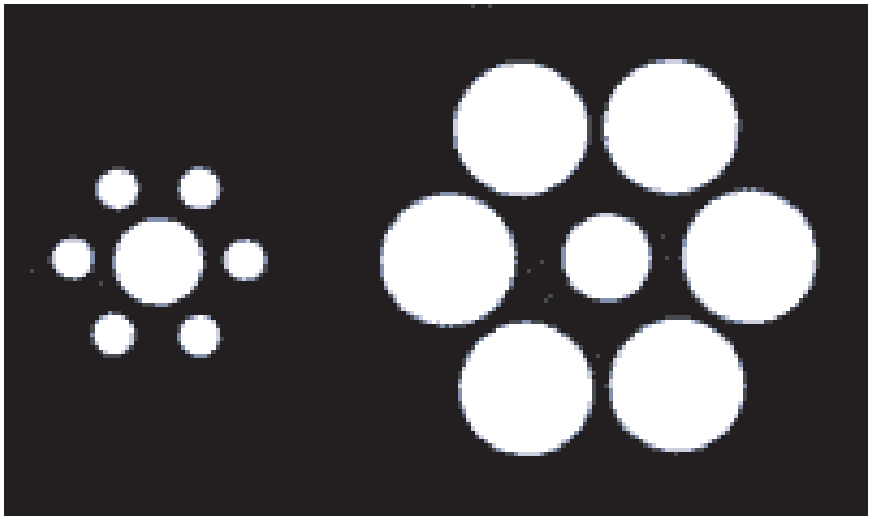
Objectives:

- Students will experience how our eyes can play tricks on us.



Discussion Questions:

- Are the lines in the image the same height/width? ***Yes***
- Why do the lines appear to be different heights/widths?



Discussion Questions:

- Are the center circles the same size? ***Yes***
- Why do the circles appear to be different sizes?

Name: _____

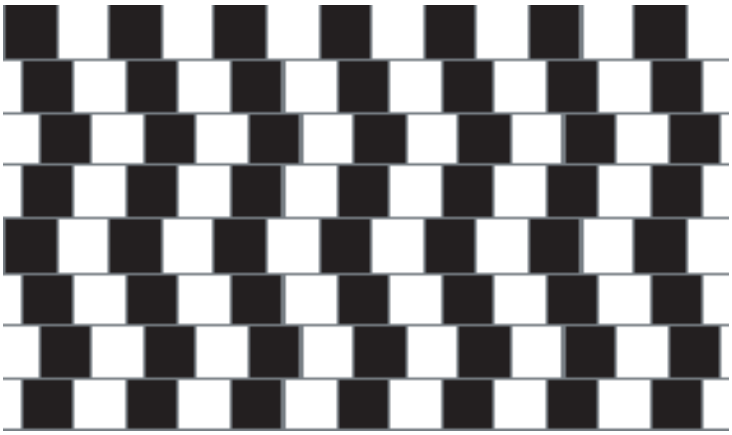
Teacher:_____

Class:_____

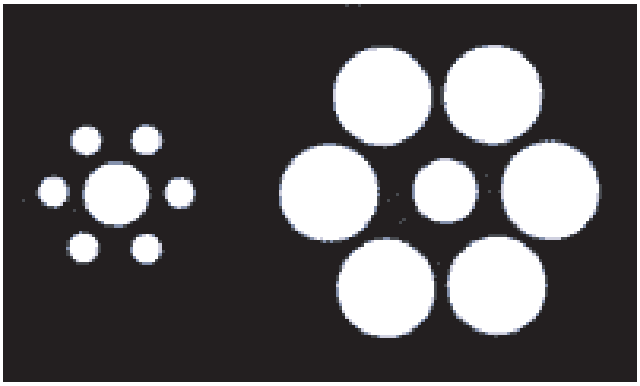
Date:_____

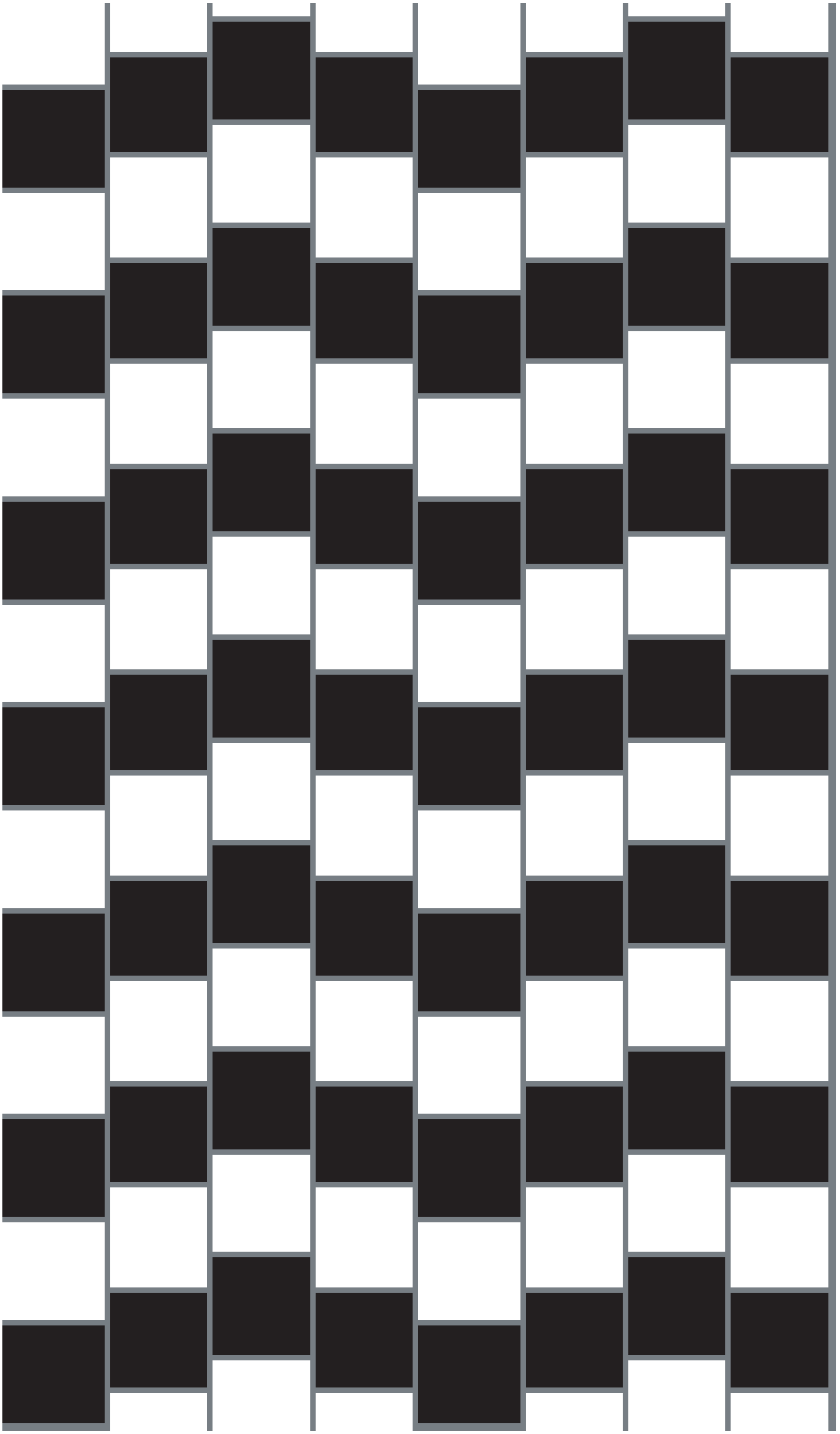
Optical Illusions

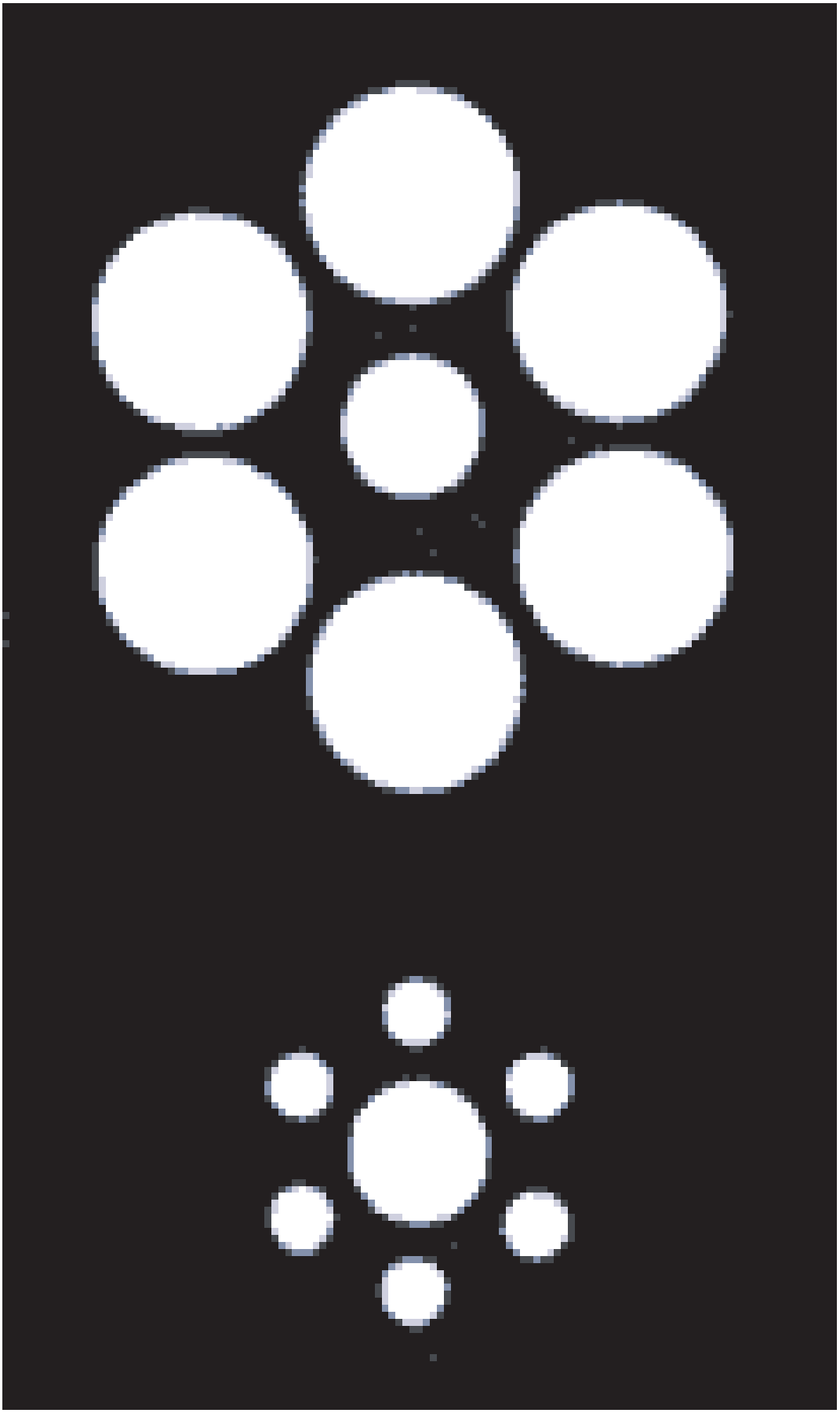
Are the lines in the image the same height/width? _____ Yes _____ No



Are the center circles the same size? _____ Yes _____ No







Additional Activity Suggestions

- Coloring page of the structure of the eye

- Simulation of the types of vision problems through adapted glasses/materials (same objects to look at/picture)

- Have an ophthalmologist or optometrist as a guest. Prepare questions as a class prior to the visit. You can request an eye care professional to visit your school through the American Optometric Association at:
- http://www.aoa.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=RequestECP

- Encourage students to have their parents or guardians take them to an eye doctor if they have not gone in the past two years. Send a letter home to parents saying that they are studying vision and encouraging the entire family to take part in the study.

- Sighted guide (blindfold) (explain the experience will not be the same as it would with a blind person who had received appropriate training). Be very cautious with this activity to avoid any accident or injury to any child.

- Have an individual who is blind talk with the class. After the individual visits, have students write a reflection on vision impairment.

- Play games that emphasize the importance of seeing and not being able to see, such as “Peek a boo,” “Hide and Seek,” or “I Spy.”

- Ask students to name all creatures with eyes and find pictures of those named.

- Make a flannel board of the parts of the eye.

Lesson Three: Glasses, Why Some People Need Them

Jeff and Arthur pose for the camera with their glasses.

Lesson Three:

Glasses, Why Some People Need Them covers the vision diagnoses that result in the prescription of glasses, who those individuals are that perform the examinations leading to the diagnoses, and how those examinations are performed.

Glasses, Why Some People Need Them

Key Vocabulary:

- Ophthalmologist
- Optometrist
- Optician
- Visual acuity
- 20/20 vision
- Near vision
- Peripheral vision
- Eye muscle coordination
- Depth perception
- Color distinction
- Lenses
- Converging
- Diverging
- Myopia
- Hyperopia
- Presbyopia
- Refractive error
- Hereditary
- Astigmatism
- Strabismus
- Amblyopia
- Ptosis
- Cataract
- Binocular vision
- Color blindness
- Retinopathy of prematurity
- Glaucoma

Lesson Objectives:

- Children will discover how vision impairment feels and looks.
- Children will learn how vision can be improved or corrected by wearing glasses.

Did You Know:

One in every 12 males is color blind.

Lesson Content:

Because the eye is so complex, defects are bound to occur. It is estimated that as many as 90 percent of us have at least slightly imperfect eyesight. About 60 percent of us need corrective lenses sometimes, if not all of the time. Only a few enjoy perfect vision without correction throughout life.

More than 50 percent of all people in the United States use some type of lens to correct their vision. More than 12 million school-age children, or one in four, has a vision impairment. One in twenty preschoolers needs vision correction. Prevent Blindness America recommends eye exams at the following intervals: birth, six months, pre-school, suspicion of an eye problem, regularly throughout the school years to ensure good vision in both eyes.

If not detected early, vision problems in children can lead to a variety of problems. Untreated vision problems can lead to loss of vision, learning difficulties, and delays in development. Screening is a means for targeting vision problems early in life so that they can be diagnosed and treated appropriately. Screenings are typically conducted in primary care, school, and community settings. Screening is not for diagnosis or to determine treatment, but to provide information.

Eye Professionals:
There are three primary types of eye care professionals:

Ophthalmologist:
An ophthalmologist is a physician (doctor of medicine or doctor of osteopathy) who specializes in the comprehensive care of the eyes and visual system in the prevention of eye injury and disease. The ophthalmologist has completed four or more years of college premedical education, four or more years of medical school, one year of internship, three or more years of specialized medical and surgical training, and clinical experience in eye care.

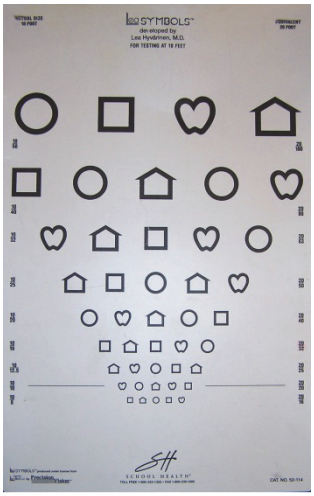
The ophthalmologist is a physician who is qualified by lengthy medical education, training, and experience to diagnose, treat, and manage all eye and visual system problems and is licensed by a state regulatory board to practice medicine and surgery. The ophthalmologist is the medically trained specialist who can delivery total eye care: primary, secondary, and tertiary care services and diagnose general diseases of the body.

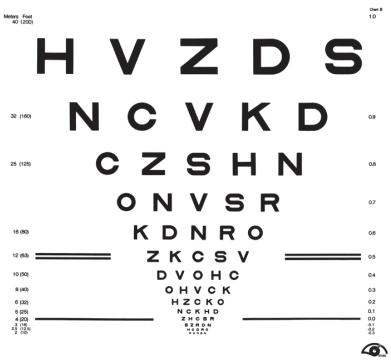
Optometrist:
Doctors of optometry (optometrists) are independent primary health care providers who specialize in the examination, diagnosis, treatment and management of diseases and disorders of the visual system, the eye and associated structures, as well as the diagnosis of related systemic conditions. The optometrist has completed pre-professional education at a college or university,

four years at a college of optometry, and in some cases, a residency. Doctors of optometry are specifically trained and state licensed to provide primary eye care services. These services include comprehensive eye health and vision examinations; diagnosis and treatment of eye diseases and vision disorders; the prescribing of glasses, contact lenses, low vision rehabilitation, vision therapy, drugs and medications; and the counseling of patients regarding their vision needs as related to their occupation, avocations and lifestyles.

Optician:
Opticians are professionals in the field of designing, finishing, fitting, and dispensing of eyeglasses and contact lenses, based on an eye doctor's prescription. The optician also may dispense colored and specialty lenses for particular needs, as well as, low-vision aids and artificial eyes.

Visual Acuity:
Vision may be tested in a number of ways. Visual acuity testing is the primary measure of the visual system. Visual acuity is the keenness of perception or the ability to discern fine visual differences. Visual acuity testing is performed to determine the integrity of the eye's neural elements, the accuracy of retinal focus, and the interpretive faculty of the brain. Visual acuity is recorded as a fraction, i.e. 20/20. The larger the bottom number the worse the vision. The top number represents the distance from the person to the chart. The bottom number indicates the smallest line a subject could read correctly from the chart. The LEA and the ETDRS charts are most typically used to measure acuity.



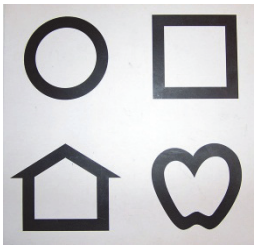


LEA & ETDRS Charts courtesy of National Eye Institute

The term 20/20 vision describes how a person sees at a distance. With 20/20 vision an individual sees clearly at 20 feet what the person with average vision sees at 20 feet. If someone is described as having 20/200 vision, they must be as close as 20 feet to see what a person with normal vision clearly sees at 200 feet.

Many individuals with less than normal vision can achieve 20/20 vision through the use of contact lenses or glasses. Twenty/twenty vision does not necessarily indicate perfect vision. Additional factors such as near vision, peripheral vision, eye muscle coordination, depth perception, and color distinction are included in the determination of perfect vision.

If young children are unable to identify their letters, a LEA chart may be used for acuity testing. LEA symbols consist of a house, apple, circle, and square; these symbols should be presented to the child before formal vision testing to ensure that they can be correctly identified. Flash cards containing the symbols are displayed for the child. At least 3 of the 4 figures should be identified for each size or distance. The visual acuity is determined by the smallest symbols that the child is able to correctly identify at 10 feet. A matching activity is available with the LEA test that may be helpful in testing very young children.



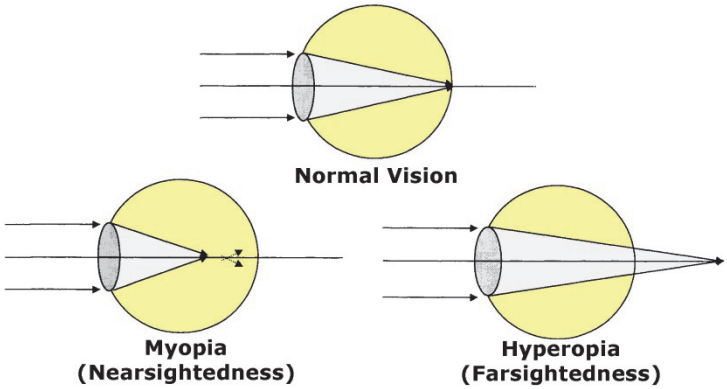
LEA Symbols used with young children.

A Little History:
The first eyeglasses were two magnifying glasses connected together at the end and hung over the nose. They date back to the late 13th century. The invention of the printing press in 1440 increased the number of reading materials available and thus the need for eyeglasses for many. By the mid-1500s eyeglasses had become a trend and were worn even by those who could not read. In 1508 Leonardo daVinci developed the concept of contact lenses, but they were not produced until 1887. These lenses, however, were made of glass and were extremely uncomfortable and impractical. Practical lenses appeared in 1938.

Recently some people are opting for laser surgery for the permanent correction of their vision. The surgery, however, is not for everyone; it does have risks.

Lenses:
Lenses are classified by shape as either converging or diverging and as spherical or cylindrical. Each type is used to correct different vision problems. These two terms, converging and diverging, refer to the effect a lens has on parallel beams of light. Spherical surfaces are the most common and used for basic refractive errors such as myopia (nearsightedness), hyperopia (farsightedness), and presbyopia (aging eye). Refractive error is a defect in the optics of the eye that results in a lack of precise focus of the light rays on the retina, causing a blurred image. Light rays entering the eye cannot be brought to a single focus. Instead they may focus in front of, in back of, or irregularly on the retina.

Common Vision Problems:



Eye anatomy leading to refractive errors.

Some vision problems are more common than others. The predominant eye problems seen in children include nearsightedness, crossed eyes, and lazy eye. Nearsightedness is the most common as it affects more than 25 percent of the population.

Common Refractive Errors:

Myopia (Nearsightedness):
Myopic or nearsighted people generally can see near objects clearly, but distant objects are out of focus. This is the result of a refractive error of the eye in which the image of a distant object is formed in front of the retina and cannot be seen distinctly; near objects are seen more clearly than distant objects.

- Myopia is thought to be primarily hereditary in nature.
- Myopia, the most common refractive error, affects more than 25% of the population.
- Myopia usually becomes evident in children between the ages of 8 and 12 and worsens until early adulthood.
- Myopia is rare in infants and toddlers.
- Myopia that starts in infancy can be more severe than in school-age children.

Hyperopia (Farsightedness):
Hyperopia occurs when the eyeball is too short. The reduced length means the point of focus lies beyond the back wall of the eye, and light rays are not yet in focus when they arrive at the retina. Hyperopic or farsighted people generally can see distant objects clearly, but near objects are out of focus. In more severe cases of hyperopia, even distant objects can be blurred.

- Hyperopia usually exists in infancy – as the child grows, so does the size of the eye. Most children lose much of their hyperopia by the time they are teenagers.
- Despite have hyperopia, most children can see well at all distances because the accommodation provided by the lens is enough to counteract minor refractive errors.

Astigmatism:
The curvature of the cornea and/or the lens prevents light rays from focusing on a single point on the retina, resulting in a blurred image. Visual acuity is poor for near and far objects.

- Astigmatism is an overall inability of the eye to focus clearly at any distance, usually because of uneven curvatures of the cornea. Essentially, the cornea is oval, having a surface shaped more like a football or the back of a spoon, rather than being rounded like a basketball.
- Virtually all corneas have at least a mild degree of astigmatism. For many, the resulting distortion is not discernible. But as the curvature of the cornea becomes more uneven, image distortion increases.
- Astigmatism often is inherited.

Common Eye Problems:

Strabismus (Cross-Eye):
Strabismus refers to eyes that are not straight or properly aligned. As a result of eye muscles not working together, one eye may turn in (crossed eye), turn out (wall eye), turn up, or turn down. The deviation, or eye turn, may be constant or come and go. In some instances, it alternates eyes – first one eye turns and then the other. In very young children, their often is an appearance of false or pseudostrabismus caused by a wide spacing of skin between the eyes that covers more of the white of the eyes than in adults. Pseudostrabismus is a common source of vision screening over-referral that can be prevented by a correctly performed vision screening.

It is critical for strabismus to be diagnosed and corrected at an early age because children with uncorrected strabismus may go on to develop amblyopia, a loss of vision in an eye that has not been used. In young children, strabismus may vary not only from one day to the next, but during the course of a single day. The condition usually will worsen if the child is ill, upset, or tired.

The preschool years are critical in the development of a child's eyes. Parents/caregivers and health care professionals always should be vigilant of any misalignment in one or both eyes. In addition to hindering the development of useful vision, strabismus may affect a child's personality. Children with strabismus may become embarrassed by their problem, feeling that they look different.

- Strabismus affects approximately 3 to 5% of children in the U.S. Half of those with strabismus are born with the condition or usually develop it within the first six months of life.
- Some of the most common causes of strabismus are birth injuries, hereditary, faulty muscle attachments, need for glasses, and illness.
- Strabismus sometimes can be found in conjunction with cerebral palsy, prematurity, and neurodevelopmental conditions. Three out of four children with cerebral palsy have strabismus.

Amblyopia (Lazy Eye):
Amblyopia is reduced vision in an eye that has not received adequate use during early childhood. An estimated 2 to 5% of the general population suffers from this visual impairment. If not treated early enough, an amblyopic eye may never develop good vision and may become functionally

blind. A condition that causes amblyopia and is left untreated until about the age of 6 most often will result in some permanent visual impairment. However, it is important that the treatment of amblyopia be pursued until at least age 10. The critical age for treatment to prevent permanent vision impairment varies from individual to individual. The earlier treatment is started, the more likely it will be easy and successful.

- Strabismus, ptosis, cataracts, and refractive errors can lead to amblyopia.
- Amblyopia is detected by finding a difference in vision between eyes.
- Amblyopia treatment involves two steps. First, correct the underlying vision problem if the amblyopia is caused by a refractive problem. Second, correct the amblyopia by retraining the brain.

Causes of Amblyopia: Amblyopia may be caused by several conditions.

Strabismus (Cross-eye)
When one eye turns while the other is in straight gaze, a double image is sent to the brain. The brain solves the confusion by ignoring the message from the turned eye, which weakens from lack of use. However, early diagnosis and treatment can restore sight. As with visual acuity problems, generally, the earlier the treatment, the better the opportunity to prevent permanent vision loss. If the strabismus requires a surgical correction, the amblyopia must be corrected first.

Anisometropia (Unequal Refractive Error)
Both eyes may be nearsighted or farsighted, but to differing degrees. Alternately, one eye may be farsighted and the other nearsighted. When there is a marked difference in refractive error between the eyes, the brain sees differing images from the two eyes and eventually ignores the eye with the poorest image.

Other Factors:
Other factors causing a difference in image quality between the eyes, such as cataracts or drooping eyelids (ptosis), can cause amblyopia. The brain suppresses the image of poorer quality, causing permanent vision loss in the affected eye, unless treated. Any condition that causes the brain to receive images of unequal quality from the two eyes can lead to amblyopia.

Color Vision Deficiency (Color Blindness):
Children with so-called “color blindness” are not blind to color but have difficulty identifying certain colors.

Blindness:
The leading cause of childhood blindness worldwide is a deficiency in vitamin A, also referred to as xerophthalmia. The most common causes of blindness in young children in the United States are congenital cataracts, retinopathy of prematurity (ROP), and other complications caused by premature births. Prenatal cataract is a leading cause of legal blindness of children under age 5. However, when appropriately managed, there has actually been a decrease in prevalence.

Advances in medicine are allowing medical professionals to save smaller and more premature infants. The lower the birth weight of a premature infant the higher the risk for and impact of abnormality.

Premature infants are born pre-term; a full-term pregnancy is 38-42 weeks. During the last 12 weeks of the pregnancy the baby's eyes develop rapidly, with the retina completing its growth a few weeks to a month after birth. In the eye of the premature infant, if the blood vessels may not have reached the edge of the retina, then the retina may not get enough oxygen and nutrients, and abnormal blood vessels will develop. These abnormal vessels are fragile and weak and can bleed, leading to retinal scarring. As scars shrink, the retina is pulled and detaches from the back of the eye. ROP does not occur in all premature infants, but when it does, it usually develops in both eyes.

Age-Related Macular Degeneration:
Age-Related Macular Degeneration (AMD) is a condition that primarily affects the part of the retina responsible for sharp central vision. There are two forms: 1 Dry AMD (non-exudative) is the most common form of the disease. Early AMD involves the presence of drusen, fatty deposits under the light-sensing cells in the retina. Late cases of dry AMD may also involve atrophy of the supportive layer under the light-sensing cells in the retina that helps keep those cells healthy. Vision loss in early dry AMD is usually moderate and only slowly progressive. Atrophy in late cases of dry AMD can result in more significant vision loss. 2 Wet AMD (exudative) is less common, but is more threatening to vision. It's called wet AMD because of the growth of tiny new blood vessels (neovascularization) under the retina that leak fluid or break open. This distorts vision and causes scar tissue to form. All cases of the wet form are considered late AMD.

The exact cause of AMD is unknown, but risk factors for the disease include age (rarely affecting those under age 50), Caucasian race and cigarette smoking. Research also suggests that long-term diets low in certain antioxidant nutrients may increase the risk of AMD. Because AMD often damages central vision, it is likely the most common cause of legal blindness and vision impairment in older Americans.

Unfortunately, there is no generally-accepted treatment for dry AMD. Laser therapies to destroy leaking blood vessels can help reduce the risk of advancing vision loss in many cases of wet AMD. Research has recently shown that certain doses of zinc, vitamins A and C, and beta-carotene can help control the advance of late AMD, but appear to have no effect in preventing the disease in otherwise healthy individuals.

Over 1.6 million Americans age 50 and older have late AMD. Age-specific prevalence rates are initially comparable between races, but advance more significantly for Caucasians after age 75. In African Americans, the disease is more prevalent in women until about age 75 as well.

Cataract:
Cataract is a clouding of the eye's naturally clear lens. Most cataracts appear with advancing age. The exact cause of cataract is unclear, but it may be the result of a lifetime of exposure to ultraviolet radiation contained in sunlight, or may be related to other lifestyle factors such as cigarette smoking, diet, and alcohol consumption. Cataract can also occur at any age as a result of other causes such as eye injury, exposure to toxic substances or radiation, or as a result of

other diseases such as diabetes. Congenital cataracts may even be present at birth due to genetic defects or developmental problems. Cataracts in infants may also result from exposure to diseases such as rubella during pregnancy.

According to the World Health Organization, cataract is the leading cause of blindness in the world. In the United States, cataract is sometimes considered a conquered disease because treatment is widely available that can eliminate vision loss due to the disease. However, cataract still accounts for a significant amount of vision impairment in the U.S., particularly in older people who may have difficulty accessing appropriate eye care due to cost, availability, or other barriers.

Treatment of cataract involves removal of the clouded natural lens. The lens is usually replaced with an artificial intraocular lens (IOL) implant. Cataract removal is now one of the most commonly performed surgical procedures with more than a million such surgeries performed each year. Surgery is not truly a cure for cataract, however, and its success in controlling vision loss comes with a price. It is estimated that the federal government spends more than $3.4 billion each year treating cataract through the Medicare program. Ongoing research into the normal healthy functioning of the eye's lens may help us better understand the causes of cataract and how they might be prevented. Even partial achievement of this goal might save hundreds of millions of dollars in the annual costs of treating cataract.

Cataract affects nearly 20.5 million Americans age 40 and older, or about one in every six people in this age range. By age 80, more than half of all Americans have cataract. Cataract is slightly more common in women than in men. It also affects Caucasians somewhat more frequently than other races, particularly with increasing age.

Diabetic Retinopathy:
Diabetic retinopathy is a common complication of diabetes. It affects the tiny blood vessels of the retina. Retinal blood vessels can break down, leak, or become blocked— affecting and impairing vision over time. In some people with diabetic retinopathy, serious damage to the eye can occur when abnormal new blood vessels grow on the surface of the retina.

Diabetic retinopathy can affect almost anyone with diabetes. The U.S. Centers for Disease Control and Prevention (CDC) estimate that 10.3 million Americans have diagnosed diabetes, while an additional 5.4 million have diabetes that has not been diagnosed. In general, the longer someone has diabetes, the greater the risk of developing diabetic retinopathy. Eventually, almost everyone with juvenile-onset diabetes will develop some signs of diabetic retinopathy. Those who acquire diabetes later in life are also at risk of diabetic retinopathy, although they are somewhat less likely to develop advanced diabetic retinopathy.

Diabetes also increases the risk of other eye diseases such as cataract and glaucoma. Because of its dangers to good vision, people with diabetes are urged to seek annual dilated eye exams. Research suggests that the risk of diabetic retinopathy can be reduced through careful control of blood sugar. People with diabetes are also encouraged to control their blood pressure. Laser treatment, called photocoagulation, has been shown to reduce the risk of sight loss in advanced cases of diabetic retinopathy. Focal photocoagulation can be used to destroy leaking blood vessels. Scatter photocoagulation, where a large number of spots are destroyed by the laser, is used to control the growth of abnormal blood vessels. In some cases vitrectomy, a surgical

procedure to remove clouded fluid and gel from inside the eye, can help. Diabetic retinopathy affects over 5.3 million Americans age 18 and older, or just over 2.5% of the population. Prior to age 40, diabetic retinopathy affects Caucasians more frequently than other races. In later decades, Hispanics are the most commonly affected by the disease.

Glaucoma is a disease that causes a gradual degeneration of cells that make up the optic nerve that carries visual information from the eye to the brain. As the nerve cells die, vision is slowly lost, usually beginning in the periphery. Often, the loss of vision is unnoticeable until a significant amount of nerve damage has occurred. For this reason, as many as half of all people with glaucoma may be unaware of their disease.

The exact cause of primary open-angle glaucoma, the most common form of the disease, is uncertain. Other forms of glaucoma (such as angle-closure, secondary and congenital glaucoma) occur in relation to specific physical causes. Elevated fluid pressure within the eye (intraocular pressure) seems related in some way to all cases of glaucoma. The majority of cases of glaucoma exhibit intraocular pressure outside normal limits at some time. However, even those cases with apparently normal pressure seem to benefit from treatment aimed at lowering pressure.

Most cases of glaucoma can be controlled and vision loss slowed or halted by treatment. Medications, laser treatments and surgery can be used to lower intraocular pressure. However, any vision lost to glaucoma cannot be restored. Unfortunately, glaucoma cannot be prevented. Factors that increase the risk of glaucoma include age, race, diabetes, eye trauma, and long-term use of steroid medications. Glaucoma is traditionally defined by a triad of signs, including the presence of at least two of the following: elevated intraocular pressure, optic disc cupping, and visual field loss.

Glaucoma affects more than 2.2 million Americans age 40 and older, or about 1.9% of this population. Glaucoma prevalence is clearly related to age and race. In general, glaucoma is more common in African Americans, Hispanics, and with increasing age. In the 65-69 age group, the prevalence rate for Caucasian females is about 1.6%, while in African American females, the rate is three times higher at 4.8%. For those age 80 and older, glaucoma affects more than 10% of African American men and Hispanic women. Glaucoma appears to be more common initially in women, but by age 65, prevalence becomes more comparable between the sexes.

Treatment:
Treatment to correct for eye disorders includes:

- Glasses to compensate for refractive error, correct a focusing problem, or overcome an eye turn
- Medications (eye drops or ointments) to treat infections, glaucoma, and occasionally strabismus or amblyopia
- Patching one eye is common in treating amblyopia
- Surgery to remove the lens if it has a cataract, reduce the pressure of glaucoma, halt vision loss due to diabetic retinopathy, or adjust an eye muscle if strabismus exists.

Key Points of Discussion:

- Why do people wear glasses? How do they help people? Glasses can help people see better. Special coating on glasses protect our eyes from the sun. Special lenses can be made to protect our eyes from injuries.
- What different kinds of glasses do people wear? Sunglasses, safety glasses, swimming goggles...
- Have you ever had to wear a patch over an eye? Do you know anyone that has? Why do you think the patch was worn?
- Read a book from the reading list and discuss it as a class.

National Health Education Standards
Standard 1 (K-4) (3)
Standard 2 (K-4) (2)

National Science Education Standards
Science as Inquiry Standard A (K-4)
Science as Inquiry Standard C (K-4)

Ohio's New Learning Standards: K-12 Science:
Grade 3: Life Science (LS)
Offspring resemble their parents and each other.
Individuals of the same kind differ in their traits and sometimes the differences give individuals an advantage in surviving and reproducing.

Reading List

- **Arthur's Eyes** by Marc Brown, Little Brown and Company, 1979, (for younger children). His friends tease Arthur when he gets glasses, but he soon learns to wear them with pride.

- **Cromwell's Glasses** by Holly Keller, Greenwillow Books, 1982, (for younger children). Cromwell the rabbit is clumsy and slow until he gets glasses.

- **Glasses - Who Needs 'Em** by Lane Smith, Puffin Books, 1995, (for younger children). A boy is unhappy about having to wear glasses, until his doctor provides an imaginative list of well-adjusted eyeglass wearers.

- **Socrates** by Rascal and Gert Bogaerts, Chronicle Books, 1993, (for preschool children). When Socrates, a homeless dog, finds a pair of eyeglasses in the street, the incident benefits him in more ways than one.

- **Watch Out Ronald Morgan** by Patricia Giff, New York Viking Kestrel, 1985, (for younger children). Ronald Morgan wears glasses and is hit in the face with a snowball.

- **1000 Facts of Human Body** by John Farndon, 2002, New York: Barnes & Noble Books. See pages 126-129 for fascinating facts on the eye and color vision.

Web Resources

Vision and the Eye:

American Ophthalmology Association Site with an Interactive Eye Illustration, Activity Sheets, and Lessons Plans:

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=TeachersCenter

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode= ActivitySheet2

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode= ActivitySheet4

Prevent Blindness America:
http://preventblindness.org/

Glossary of Terms:
http://www.tedmontgomery.com/the_eye/glossary/A.html

Vision Learning Activities:

Exploratorium of Activities:
http://www.exploratorium.edu/snacks/
(See Science Snacks)

Vision Experiments and Activities for Children: Neuroscience for Kids:
http://faculty.washington.edu/chudler/neurok.html
(go to Explore the nervous system, then to Sensory systems)

Realeyes: The Ohio Optometric Association's Education Initiative (for students by grade level, teachers, and parents):
http://ooa.org/Intro.html

Additional Downloadable Resources:

Vision: A School Program for Grades 4-8
National Eye Institute
http://www.nei.nih.gov/education/visionschool/index.asp

Wild About Healthy Vision: Activity Book for Ages 9-12
See All You Can See: Activity Book for Ages 6-8
US Dept. of Health and Human Services
National Institute of Health
National Eye Institute
http://www.nei.nih.gov/order/pub_sorted_by_title.asp

Other:

National Library of Medicine: Genetics Home Reference:
http://ghr.nlm.nih.gov/ghr/page/Home

Information on Health and the Body for Parents, Kids, and Teens:
http://www.kidshealth.org/

Medical Library with Information on Eye Health:
http://www.medem.com/MedLB/sub_detaillb.cfm?parent_id=30&act=disp.cfm

Activity Suggestions

- Simulation of the types of vision problems through adapted glasses/materials (same objects to look at/picture)

- Have an ophthalmologist or optometrist as a guest. Prepare questions as a class prior to the visit. You can request an eye care professional to visit your school through the American Optometric Association at:

  http://www.magnetmail.net/forms/display_form.cfm?fid=4380&rtype=nonmm

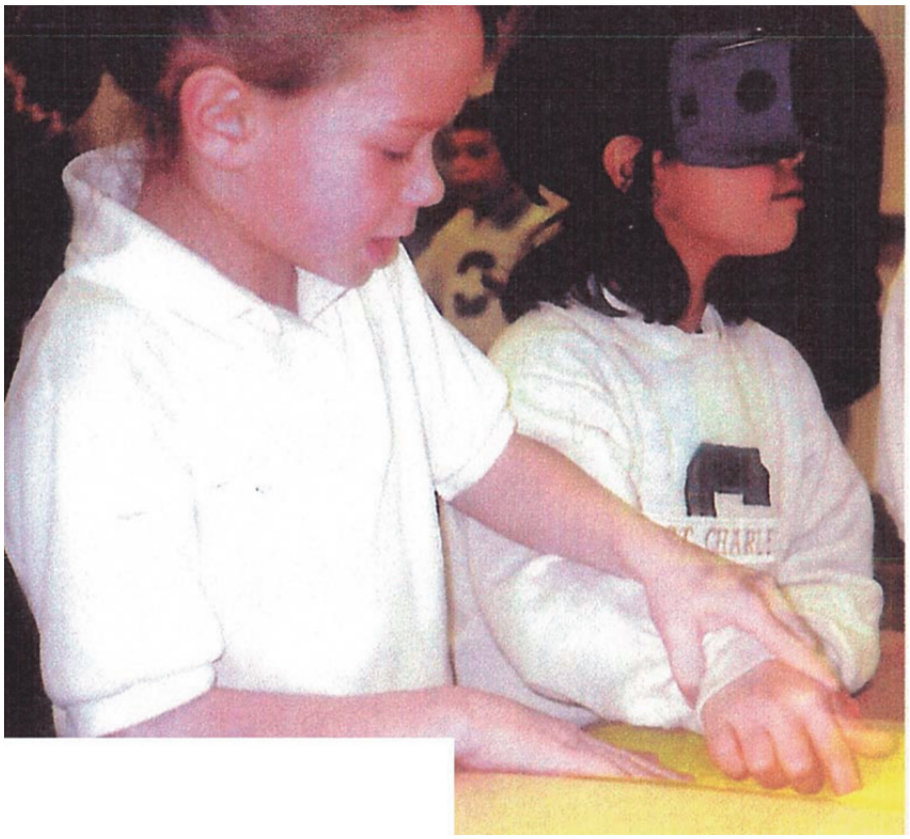
  or the American Academy of Ophthalmology at:

  http://www.aao.org

- Encourage children to have their parents/guardians take them to an eye doctor if they have not gone in the past two years. Send a letter home to parents saying that they are studying vision and encouraging the entire family to take part in the study.

- Conduct a used eye glasses drive-in collaboration with the local Lions Club.

Lesson Four: A World Without Sight



Brian aids blindfolded Natasha in reading Braille.

Lesson Four:
A World Without Sight is an introduction to individuals with vision impairments that cannot be corrected through lenses, how individuals with visual impairments perform day to day tasks, and how to interact with individuals who are blind or visually impaired.

Key Vocabulary:

- Vision impairment
- Low vision
- Partially sighted
- Blindness
- Color blindness
- Color deficiency
- Sighted guide
- Dog guide
- Braille

Lesson Objective:

- Students will be able to tell another child or adult what blindness or vision impairment means.
- Students will name ways people with vision loss can take care of themselves.

Introduction:

We are all individuals and as individuals not all people see the same. An individual with vision impairment has eyesight that cannot be corrected to a “normal” level, making everyday tasks more difficult or impossible without adaptations. The impairment could be due to loss of visual acuity or loss of visual field caused by damage to the eye itself, the eye being shaped incorrectly, and the inability of the brain to process visual information correctly. Vision impairment can occur at any time in a person’s life, but is more common in older people.

A number of terms are used to describe various degrees of visual impairment.

Did You Know:

Every minute a child somewhere in the world goes blind. Every 5 seconds an adult goes blind.

Lesson Content:

Blindness & Visual Impairment:

The term “blindness” can have many connotations and is difficult to define. To many people, blindness refers to the complete loss of vision with no remaining perception of light. However, this ultimate form of complete blindness is rare. Far more people have a permanent loss of some, but not all, of their eyesight. “Legal blindness” represents an artificial distinction, but it is significant in that it determines eligibility for certain disability benefits from the Federal Government. In the United States, it is typically defined as visual acuity with best correction in the better eye worse than or equal to 20/200 or a visual field extent of less than 20 degrees in diameter. Vision impairment is defined as having 20/40 or worse vision in the better eye even with eyeglasses. Almost everyone with blindness or vision impairment can benefit from vision rehabilitation that can help make the most of whatever vision remains. Unfortunately, blindness and vision impairment represent a significant burden. It is estimated that blindness and vision impairment cost the federal government more than $4 billion annually in benefits and lost taxable income.

Color Blindness:

In addition, some individuals have color blindness because the color-sensitive cones in their retina are either absent or do not work properly. Rarely are individuals unable to identify any colors. Color deficiency rather than color blindness is used when the ability to distinguish certain colors and shades is less than normal. The two major types of color deficiency are red- green deficiency and blue-yellow deficiency. These result in the inability to perceive colors correctly and distinguish certain shades.

Vision Impairment:

Vision impairment affects each individual differently. Individuals with the same visual acuity may be able to use their remaining vision to function in their environments performing necessary tasks.

Visual impairments can result in delays or limitations in motor, cognitive, and social skills as it changes how a child experiences the world, understands the world, and functions in the world. Approximately two-thirds of children with vision impairment also have one or more developmental disabilities.
Nearly one million Americans have lost some degree of sight due to an eye injury.

Individuals Who Are Blind:
Laws have been established that allow individuals who are blind to have access to the same public places as individuals who are sighted. Individuals who are blind also are entitled to use another individual, a cane, or a dog to aid in their mobility in such places. Individuals decide which type of assistance is most appropriate for their lifestyle, a cane or a dog. A cane enables individuals to locate obstacles prior to reaching them. The dog guide is trained to move around obstacles, through doorways, and to stop at curbs and stairs. The dog aids the individual in locating objects, avoiding obstacles, and traveling safely. The individual that is blind remains in charge and tells the dog what to do. Individuals who are blind can be accompanied by their dogs anywhere the general public is allowed.

For an individual who has recently become blind, the experience can be frustrating and frightening. Once skills are learned to perform tasks without the use of vision, those feelings are overcome. Individuals who are blind can do the same things as individuals with sight. Blindness becomes a characteristic of the individual, as is hair or eye color. Blindfolding is often used to simulate blindness, but caution should be used. Individuals who are blind have had training and experience to avoid obstacles, orient themselves, and travel without incidence. Patience also is required. Lost items can be found, but not as quickly as they would be with normal vision.

Do not assume an individual who is blind needs assistance. He or she may ask you or you can ask if he or she would like your assistance. If the person wants your assistance when walking, he or she may take your arm (sighted guide) or walk beside you. Individuals who are blind or partially sighted might be affected by lighting conditions, therefore their vision will vary in dark as opposed to bright settings. Training, experience, and the use of adaptive devices can affect how successfully an individual performs a specific task. Each person is different. Rehabilitation specialists can provide training on mobility, the performance of daily tasks, and how to maximize residual vision.

Many products have been developed to help individuals who are blind and visually impaired perform daily tasks. Some of those include:

- Large Print Books
- Talking Calculators
- Talking Watches and Clocks
- Braille Watches
- Large Face Watches and Clocks
- Magnifier Lamps
- Talking and Large Display Money Identifiers
- Braille Typewriters
- Canes and Accessories
- Screen Reading Software
- Large Print Cards

Individuals who are blind can do just about everything a person with sight can do, from play to education to occupations. Children who were blind used to go to residential schools with other students who were blind. Today most attend schools in their community. When you are unable to see using your vision, you must rely on your other senses to obtain information. You need to listen, note specific smells, and use touch.

How do individuals who are blind identify money?
Coins are identified by using the sense of touch. Coins are different sizes and some have ridges. Paper money can be stored in different parts of the wallet or can be folded in different ways.

How do individuals who are blind identify their clothes?
Again the sense of touch can assist the individual who is blind with the identification of clothing. Any unique feature of the clothing can be used for identification purposes, such as buttons, bows, zippers, textures, pockets, elastic, etc. Clothing also can be marked in various ways by adding buttons, cutting corners off of tags, and adding Braille tags. When individuals that are blind cannot see color, they must learn how to match appropriate colors for clothing and decorating.

How do individuals who are blind shop for groceries?
The sense of touch, smell, and taste can both aid in the identification of food. When shopping for food, many individuals who are blind will shop with a friend who can help them find and identify items, in addition to reading labels. A list also can be made for someone else to perform the shopping. Once products are purchased, they can be labeled using Braille, or other tactile cues for identification, such as rubber bands and magnets. Shape, size, weight, and sound also can be used to identify foods or food products can be stored in specific locations. Taste can even be used to distinguish one food product from another.

How do individuals that are blind cook their food?
Braille labels and marking dots can be used to mark temperature dials on the stove or oven. Senses can be used to determine the smell, sound, temperature, time of cooking, texture, and consistency when cooking. Special training programs and tools are available to help with cooking tasks. Aids also are available to assist with cooking tasks, such as, a liquid level indicator will beep when the vessel is full.

How do individuals that are blind know when it is safe to cross the street?
Individuals who are blind listen for the sounds of the traffic to know when they can cross the street. In addition, many traffic lights also provide audible signals.

How You Can Help:

- When providing directions to an individual who is blind, be sure to use right and left according to the way the person is facing.
- You should speak when entering a room, as well as when you depart.
- Make sure to introduce yourself to strangers.
- Remember that your words and tone of voice will be interpreted and not visual cues.
- Offer your arm to a blind person in need of guidance. Stay a half step ahead of the person who is blind so he or she can anticipate your movements.
- When greeting an individual who is blind, ensure he or she knows who you are addressing by using the person's name or a touch to the arm.
- Always ask an individual who is blind if he or she would like assistance before assisting him or her.
- When an individual who is blind is using a dog guide, do not pet or distract the dog since the dog is working.
- Be natural. Extend your hand. Do not hesitate to use everyday words such as look, see, and blind.

- Address an individual who is blind directly. Individuals who are blind are ordinary people who do ordinary things. Some even do extraordinary things.

Louis Braille:
Louis Braille invented the Braille code when he was only 15 years old. A visit by a military captain who demonstrated a complicated system of raised dots used by soldiers to communicate in the dark (night writing) inspired Louis. Over a course of three years, Louis simplified the night writing system known today as "Braille."

Braille was found to be easier to read, while writing raised print letters was found to be almost impossible. The Braille code is a six-dot cell system that will fit under one fingertip. However, Braille takes up more space than print, for example, Harry Potter and the Goblet of Fire is 10 volumes in Braille. Today Braille is used all over the world. Unfortunately Louis died at age 43 from tuberculosis and did not see the wide adoption of Braille.

Helen Keller:
Helen Keller was not only blind, but also deaf-blind. In her early years she had no way to communicate. She learned and began using sign language for communication. She later learned Braille, which enabled her to read other people's writing and to express herself through writing. Helen went to college and later was an official spokesperson for the American Foundation for the Blind (AFB).

What is Braille?
Braille is a system of raised dots that form letters that can be read with the fingertip. The basic Braille cell is made up of two columns with three dots in each. The dots are numbered as shown below.

These six dots are used in various combinations to express words, punctuation, numbers, and musical notes. Individuals who are blind memorize the different combinations and their meanings.

Basic Braille cell.

Braille books are much larger in size than typical books.

Key Points of Discussion:
- What do you think it would be like if you couldn't see?
- How do you know if someone is blind?
- Why do some people who are blind wear dark glasses? To let others know they are blind. Their eyes may not look like yours or mine. To protect their eyes.

- How do you think a person who is blind gets around? Cane, dog guide, a sighted person leading them…
- Read one of the following books and discuss how the book relates to the lesson.
    - Let's Take a Walk in the Zoo
    - My Five Senses
    - My Hands, My World
    - Through Grandpa's Eyes
- How do people who are blind read? Braille, a reader, a computer, books on tape…
- How do people who are visually impaired read? CCTV/magnification, Braille, a reader, a computer, books on tape…
- What is the difference between blindness and low vision? People who are blind have either no sight or very minimal sight, for example some can only tell a lighted area of a room such as the light from a window. People with low vision have a severe vision impairment, but can use aids to enhance their functional vision.
- What types of items might a person with low vision use to help them do everyday tasks? Dots, magnification, textures, etc.

National Science Education Standards
Science as Inquiry, Standard A (K-4)

National Health Education Standards
Standard 1 (K-4) (1)
Standard 2 (K-4) (2)
Standard 3 (K-4) (1, 2, 3, 5, 6)

Ohio's New Learning Standards: K-12 Science:

Kindergarten: Physical Science (PS)
Objects and materials can be sorted and described by their properties.

Grade 1: Life Science (LS)
Living things have basic needs, which are met by obtaining materials from the physical environment.
Living things survive only in environments that meet their needs.

Grade 1: Physical Science (PS)
Objects can be moved in a variety of ways, such as straight, zigzag, circular and back and forth.

Reading List

- **My Hands, My World** by Catherine Brighton, MacMillan, 1984, (for all ages).
  This is the story of the quiet day of a young blind girl which reverberates with sensuous detail. Full-color paintings fill the pages with figures in shadow and light. The world is dreamlike, taking readers into a very special world of feeling.

- **Sylvester and the Magic Pebble** by William Steig, Windmill Publishers, 1969, (for younger children).
  In a moment of fight, Sylvester the donkey asks his magic pebble to turn into a rock but then cannot hold the pebble to wish himself back to normal again.

- **Redbird** by Patrick Fort, Orchard Books, 1988, (Braille) (for younger children).
  Redbird, a small airplane, encounters numerous hazards as it attempts to land at the airport. Text is in Braille and in clear black type; raised letters can be both felt and seen.

- **Red Thread Riddle** by Jensen/Edman, New York Collins, 1979, (Braille) (for younger children).
  Follow the thread wherever it goes, but use your fingers and not your nose! Follow it and you will find questions and answers, the funny kind.

- **What's That?** by Virginia Allen Jenses, Collins & World, 1978, (Braille) (for younger children).
  Where has little shaggy gone? Find out by feeling the difficult shapes and textures of little shaggy and his friends on the pages of this innovative book.

- **Through Grandpa's Eyes** by Patricia MacLachan, Harper & Row, 1980, (for younger children).
  John loves grandpa's house the best because he sees it through grandpa's eyes. Grandpa is blind but he has his own way of seeing.

Web Resources

Vision and the Eye:

American Ophthalmology Association Site with an Interactive Eye Illustration, Activity Sheets, and Lessons Plans:

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=TeachersCenter

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=ActivitySheet2

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=ActivitySheet4

Prevent Blindness America
http://preventblindness.org

Glossary of Terms:
http://www.tedmontgomery.com/the_eye/glosssary/A.html

Vision Learning Activities:
Exploratorium of Activities:
http://www.exploratorium.edu/snacks/
(See Science Snacks)

Realeyes: The Ohio Optometric Association's Education Initiative (for students (by grade level), teachers, and parents):
http://ooa.org/Intro.html

Animal Eyes:
ThinkQuest: Sighting the First Sense: Seeing is Believing. http://library.thinkquest.org/C001464/cgi-bin/main.cgi?

Braille:
American Foundation for the Blind …Braille: Deciphering the Code…:
http://www.afb.org/braillebug/braille_deciphering.asp

American Foundation for the Blind (Braille for Children): http://www.afb.org/braillebug/

Visual Impairment and Blindness:
http://www.losteye.com
http://www.guidedogs.com/

Additional Downloadable Resources:

Vision: A School Program for Grades 4-8
National Eye Institute
http://www.nei.nih.gov/education/visionschool/index.asp

Wild About Healthy Vision: Activity Book for Ages 9-12
See All You Can See: Activity Book for Ages 6-8
U.S. Dept. of Health and Human Services
National Institute of Health

National Eye Institute
http://www.nei.nih.gov/order/pub_sorted_by_title.asp

Other:

National Library of Medicine
Genetics Home Reference:
http://ghr.nlm.nih.gov/ghr/page/Home

Information on Health and the Body for Parents, Kids, and Teens:
http://www.kidshealth.org/

Medical Library with Information on Eye Health:
http://www.medem.com/MedLB/sub_detaillb.cfm?parent_id=30&act=disp.cfm

Mystery Jars

Objectives:

- Students will identify different scents using only their sense of smell.
- Students will begin to understand how difficult it is to use an alternative sense if they were unable to use their vision.

Did You Know:

- Smells are mixed in with the air around you. To identify smells, you breathe or smell in air to move past smell detectors in the upper part of your nose.

- Snakes smell with their tongues.

Materials:

- Cotton balls
- Various extracts (lemon, peppermint, maple, orange, banana, etc.)
- Film canisters or other small containers with lids
- Paper
- Pencil

Precautions:

- Use care when implementing this activity, especially with students prone to asthma and allergies. Oils, such as cinnamon, also may cause rashes.

Activity Instructions:

1. Pour extract onto a cotton ball.
2. Place cotton ball in container, continue to do this until you have at least 5-6 different containers and scents.
3. Use a sharp object to poke a small hole on the top of the lid and place on film canister.
4. Number each canister.
5. Make a key of each scent with corresponding number (e.g. 1- lemon, 2- orange)
6. Have students smell each container and write down the number and which scent they think they smell for each container.

Discussion:

- Were any of the scents harder to detect than others?
- Did it get more difficult after each smell to determine the smell? (Smell detector overload)
- What problems could arise if you no longer had the sense of smell? (e.g. couldn't smell if something was burning, couldn't smell if food was bad)
- Do you think food would taste differently if you could no longer smell it?
- Would it be easier to identify the scent if you could see the color of the extract?

National Science Education Standards

Science as Inquiry, Standard A (K-4)
Physical Science, Standard B (K-4)
Life Science, Standard C (K-4)

Sound Recognition

Objectives:

- Students will identify sound without sight of object.
- Students will learn how sound can warn us of danger.

Did You Know:

- Sound travels in waves.
- Ears change sound into signals that are sent to your brain.
- Your brain translates these signals into the sounds you hear.

Materials:

- Musical instruments (sticks, bells, tambourine, drums, etc.)
- Tape of sounds (sirens, cry for help, fire bell, etc.)
- Tape recorder
- Box or board
- Paper and pencil for graph

Activity Instructions:

1. Graph of different sounds
2. Hide objects (that produce sound) behind a box or board
3. Next, students will try and guess the object that makes each sound
4. Mark off answers on graph
5. Go over correct and incorrect results on graph

Discussion:

- Were any of these sounds harder to tell apart than others?
- How does our sense of hearing help keep us out of danger or save someone else from danger?
- Do you think it would be harder to detect where a sound was coming from with hearing loss to only one ear? (Experiment - have students close their eyes and cover one ear, while another group walks around the room making noise. Have the first group of students point to the direction of the sound).

Activity Extensions:

- Play different types of music and have students draw while listening to the music - discuss the colors students chose for the different styles of music.
- Use a tuning fork and pan of water to observe sound; test various items to see how they vibrate.

Discussion:

- How do your senses work together? If one sense is missing, do the others help to make up for the missing sense?

What's in the Bag?

Objectives:

- Students will identify an object by touch alone.
- Students will use the sense of touch to understand the importance of their vision.

Did You Know:

- We easily feel things that touch our skin.
- Nerves in the skin detect them and tell us how hot, cold, painful, soft, etc. an object is.

Materials:

- Bag or pillowcase
- Various objects (all shapes and sizes)

Activity Instructions:

1. Place objects in bag previous to students' arrival
2. Have students (one at a time) reach into the bag and hold one object
3. Make sure the students do not peek at the object
4. Have students guess what the object is by touch alone
5. After students make a prediction, have the students pull out the object to see if they were right.

Discussion:

- How often were your predictions right?
- What sense were you deprived of during this activity?
- What sense did you rely on for this activity?
- Do you think life would be more of a challenge if you had to only rely on your sense of touch to figure out what every object in your surroundings is?

National Science Education Standards

Science as Inquiry, Standard A (K-4)
Life Sciences, Standard B (K-4)

Pirate Toss

Objectives:

- Students will experiment with monocular vision.

Did You Know:

- Monocular vision is the loss of sight in only one eye. The main problem with monocular vision is the loss or reduction (10-20%) of peripheral vision (side vision).

Materials:

- Eye patch or eye cover
- Ball (Caution: use a large, foam ball like a Nerf ball)
- Pairs of students

Activity Instructions:

1. Have each student cover or patch one eye.
2. Let the students take turns passing a ball to one another.
3. Have students count how many catches were made.
4. Have students repeat activity without the patch and count how many catches were made.

Discussion:

- How many catches were made with monocular vision compared to full vision?
- Do you think you would be able to ride a bike or skate safely with sight in only one eye?
- How does having peripheral vision help us?

Activity Extension:

- Use toilet paper tubes and paper towel tubes of differing lengths.
- Graph results.

Touch Reading

Objective:

- Students will experiment using their sense of touch to read letters and numbers.

NOTE:

This exercise is not using the Braille alphabet, only raised numbers and letters of the standard alphabet. Please show students a copy of the Braille alphabet before doing this exercise. Braille alphabet cards are available at no charge from the National Braille Press, 88 St. Stephen Street, Boston, MA, 02115; Toll-free: (888) 965-8965 or http://www.nbp.org/ic/nbp/braille/cards.html

To print the Braille alphabet or to order Braille alphabet cards in bulk go to: http://www.afb.org/braillebug/braille.asp

Did You Know:

- Individuals who are visually impaired read the Braille alphabet. The Braille alphabet is a series of raised dots, read by running your fingertips across the top of the dots.
- The Braille alphabet was created in 1821.

Materials:

- Corkboard or Styrofoam
- Map pins
- Marker
- Scissors
- Blindfolds or sleep shades

Activity Instructions:

1. Cut corkboard or Styrofoam into squares.
2. Use a marker and draw letters of the alphabet or numbers on each square.
3. Outline the letters or numbers with map pins.
4. Have students cover eyes.
5. Students then use their fingertips to try and read the number or letter.

Discussion:

- How difficult was this exercise?
- How long do you think it would take you to read a book if it was printed in this way?
- How often did you guess the right number or letter?

Additional Activity Suggestions

- Simulation of the types of vision problems through adapted glasses/materials (same objects to look at/picture).
- Sighted guide (blindfold) (explain the experience will not be the same as it would with a blind person who had received appropriate training).
- Have an individual who is blind or has a vision problem talk with the class.
- Show and explain the Braille alphabet provided by Braille Bug free of charge at: http://www.afb.org/braillebug/braille.asp
- Have students write their name using Braille dots.
- Print the Braille alphabet and have students draw their name using Braille dots.

Lesson Five: Taking Care of Our Eyes

Taking Care of Our Eyes stresses the importance of making wise lifestyle – safety choices to protect the precious gift of sight for a lifetime.

Key Vocabulary:

- Ultraviolet (UV) radiation
- Eyelid
- Conjunctiva
- Sclera
- Cornea
- Lens
- Retina
- Nerves
- Retinal detachment
- Cataract
- Orbital bones
- Alkalis
- Acids
- Irritants
- Fumes
- Ventilation
- Conjunctivitis
- Sties
- Blepharitis

Lesson Objective:

- Children will be able to name or point to at least four hazards to our eyes.
- Children will tell a peer or adult at least three safety rules for protecting our eyes from injury.
- Children will explain what the eye doctor does to help us.

Did You Know:

- About 90 percent of all eye injuries and 50 percent of all cases of blindness are preventable.

LESSON CONTENT:

The Weather & Eye Safety:

The weather can hurt our eyes. Sun, sand, water, snow, and wind can hurt your eyes if you don't protect them. The sun emits many types of rays, including visible light, which lets you see; infrared radiation, which is invisible, but felt as heat; and ultraviolet (UV) radiation which, also is invisible is often called the "sunburn" ray. The weather can fool you as UV radiation is as bad on cloudy days as it is on sunny days.

Exposure to UV rays can damage your eyes and contribute to vision loss from macular degeneration and cataracts. Corneal sunburn can result from bright sunlight reflected off of beaches and ski slopes. Long-term exposure can lead to cataracts, skin cancer around the eyelids, and macular degeneration. Sunglasses with 99-100% UV protection of both types of ultraviolet rays: UVA and UVB can protect your eyes from invisible UV rays that can harm your eyes, as well as eliminate glare and squinting. Sunglasses without UV protection shade the eyes from bright sun, but cause the pupils to dilate, allowing in more harmful rays. You should not wear sunglasses if they are scratched, have bubbles, or have distortions because damage to your eyes can occur. Lenses also should be large enough to shield the eyes from most angles and to block light that enters in around the frames. The sunglasses also should fit snugly against the bridge of your nose. For maximum protection add a wide-brimmed hat; a wide-brimmed hat can protect you from as much as 50% of UV radiation. Hats also reduce the sunlight that can enter your eyes from the sides or top of sunglasses. Adults and children are both at risk for eye damage caused by UV radiation.

Eye Injury:

All eyewear should protect eyes from impact hazards. When safety is an issue, lenses should be made from polycarbonate materials, which provide the highest level of impact protection. Lenses in all glasses are required to meet FDA minimal impact standards established in 1971, but these lenses do not provide adequate protection for many common impact hazards. Polycarbonate lenses are the most impact resistant lenses available in eyewear. You should look for lenses with the Z87.1 approval code on the outside of the box; these lenses meet the standards of the American National Standards Institute (ANSI).

The frequency and severity of at least 90 percent of all eye injuries to children can be reduced by understanding the dangers, identifying and correcting hazards, and using greater care when supervising children.

A large number of eye injuries occur each year in the United States. A good number of those are to individuals 17 years old and younger. The most common eye injury reported is a foreign body in the eye, followed by open wounds and contusions, and then burns. Nearly one million Americans have lost some

degree of sight due to an eye injury, with most individuals becoming blind in one eye. The highest number of eye injuries occurred at home. Most injuries can be prevented. In others, the effects can be minimized.

If an eye injury occurs, immediately tell someone and have that individual take you to see an eye doctor, or take you to the closest emergency room. Serious injury is not always immediately seen or felt, or as minor as it first appears. Delaying medical attention can result in more extensive injury, and possibly permanent vision loss or blindness.

Causes of Eye Injury in Children:
The most common causes of eye injuries to children include:

- Misuse of toys or altering toys.
- Falls involving home furnishings and fixtures such as beds, stairs, tables, and toys.
- Misuse of everyday objects like home repair and yard care products, personal-use items, kitchen utensils, silverware, pens and pencils.
- Accidental exposure to harmful household and cleaning products such as detergents, paints, pesticides, glues, and adhesives.
- Automobile accidents (which are the leading cause of death and serious injuries, including eye injuries, to young children).
- Fireworks
- Not using eye protection while playing sports

The most hazardous products to children's eyes include:

1. Toys (excluding bicycles and guns)
2. Pens & pencils
3. Baseball and Softball
4. Water and Pool Activities
5. Adhesives
6. Guns (air, spring, BB)
7. General purpose household cleaners
8. Furniture (sofas, beds, tables)
9. Basketball
10. Flatware and Table settings
11. Bleaches (non-cosmetic)
12. Cigarettes, Cigars, Pipes, Lighters
13. Grooming, Cosmetics (hair care, makeup)
14. Paper and Cardboard products
15. Gasoline and Gas cans
16. Desk Supplies
17. Chemicals (unspecified)
18. Bathroom-related (fixtures, soap)
19. Bicycles
20. Manual hand tools (screwdrivers, hammers, etc.)

Eye Injuries At Home:
A large number of eye injuries happen at home. A significant number of the injuries to children age 14 and younger are related to toys and play activities. Ninety percent of eye injuries are preventable.

Avoid toys that shoot or include parts that fly off, including slingshots and water guns. Toys should be solid with no sharp edges or points. The toys also should withstand impact. If a toy meets the national safety standards set by the American Society for Testing and Materials, the letters ASTM will be indicated on the toy or packaging. In addition, the misuse of toys can lead to injury.

The most dangerous toys to children's eyes include:
Toy Weapons:

- Guns: BB, pellet, gas, air, & spring
- Toy weapons (combined types)
- Slingshots & sling propelled toys

Other Toy Products:

- Playground equipment
- Bicycles
- Balloons (toy)
- Scooters, skates, skateboards
- Toy sports equipment
- Flying toys
- Trampolines
- Toys – other and unclassified

Eye Injuries Outside of the Home:
Classroom projects, physical education classes, industrial arts, vocational arts, and sports present risks for impact or impact penetration eye injuries. Most blunt impact eye injuries are mild, yet can force the eye back into its socket, damage surface structures (eyelid, conjunctiva, sclera, cornea, lens), damage structures in the back of the eye (retina, nerves), lead to retinal detachment, cataract, and orbital bones fracture (blow-out fracture that allows the eye to fall out), and cause black eyes, blood leaking into the skin, and vessels on the surface of the eye to break.

Chemicals & Eye Injuries:
Chemicals used in the science lab can cause damage to the cornea that is irreversible, requires surgery, corneal perforation, corneal scarring, intraocular pressure resulting in glaucoma, and weaken cell structure increasing the risk of infection. Damaging chemicals include alkalis, acids, irritants, and fumes.

The higher the pH level in a chemical, the more damage the chemical can cause to the eye. These chemicals penetrate the surface of the eye and destroy the cell structure. Strong alkalis can penetrate the cornea for up to six weeks. Common alkalis are hydroxides of ammonia, potassium, sodium, calcium, and magnesium. Household items such as lye, cement, lime, and ammonia also contain alkalis.

Acids have a low pH. All but hydrofluoric acid tend to cause less severe burns to the eye. Acids generally damage the front of the eye. Acid burns are typically the result of sulfuric acid (from automobile battery explosions), sulfurous acid, hydrochloric acid, nitric acid, chromic acid, and hydrofluoric acid.

Irritants have a neutral pH. Most are detergents that simply cause discomfort to the eye. Chemical fumes are irritants and can cause burns on the eye.

If you or someone else gets a chemical in the eyes, immediately flush the eye or eyes with water. Keep the eye open and flush the eye for at least 15 minutes. The longer the chemical remains in the eye, the more extensive the damage will be to the eye. After flushing, go to see an eye doctor or to the emergency room. Take the chemical and/or information pamphlet with you.

Proper eye protection and ventilation aid in the prevention of chemical injury.

Heat & Eye Injuries:
Heat eye injuries result from exposure to high temperature splashes of molten metal or hot sparks. In addition, laser induced eye injuries are the result of intense concentrations of heat, ultraviolet (UVA, UVB, and UVC), infrared, and reflected light radiation. Both direct and indirect laser light can damage the eye. For example, laser pointers can create intensities greater than those experienced by looking directly at the sun. Ultraviolet induced eye injuries consist of UVA, UVB, and UVC. For heat induced eye injuries, seek medical attention or go directly to the emergency room if exposed to intense laser and ultraviolet light. Appropriate eye protection can help to prevent impact eye injuries.

Sports & Eye Injuries:
If your eyes are not protected during sports activities, you are at risk of eye injury and vision loss. Prevent Blindness America recommends that athletes wear sports eye guards when participating in sports. These eye guards should fit securely and comfortably and allow the use of a helmet if necessary. Prescription eye guards can be fitted by an eye doctor. Eye guards made from polycarbonate material provide the most impact resistance. For sports use, polycarbonate lenses must be used with protectors that meet or exceed the requirements of the American Society for Testing and Materials (ASTM). Each sport has a specific ASTM code. The lenses should either stay in place or pop outward in the event of an accident. Sports eye guards should be padded or cushioned along the brow and bridge of the nose to prevent the eye guards from cutting into the skin. Trying on the eye guards before purchase helps to insure a correct and comfortable fit. Note: monocular athletes should ask the eye doctor what sports can be played safely. When fitted properly, protective eyewear can prevent 90 percent of sports eye injuries.

The sports associated with the most eye injuries are:

- Basketball
- Water Sports
- Baseball/Softball
- Soccer
- Paintball

Fireworks & Eye Injuries:
Eyes are the second most commonly injured part of the body as the result of fireworks. The greatest estimated number of eye injuries reported were associated with bottle rockets, firecrackers, and sparklers. Bruises and lacerations were the most common eye injuries, whereas burns were the most frequent injury to the rest of the body. Almost half of the injuries resulting from fireworks were to children age 15 and younger. Sparkers caused about one third of the injuries in children age 5 and younger. Sparklers burn at

up to 1800 degrees Fahrenheit and are a leading cause of fireworks-related injuries. In addition, bystanders are more often injured by fireworks than the operator. Fireworks can explode in the hand, throw sparks in the face, cast hot fragments onto limbs, and ignite clothing.

Eye Injuries & Contact Lenses:
Contact lenses are an alternative to glasses for vision correction. According to the American Optical Association, over 30 million Americans wear contact lenses. Ten percent of contact wearers are under the age of 18. Most contact lens wearers are female and nearsighted.

Some people prefer contact lenses to glasses because they move with your eye; there are no frames with contacts to obstruct your vision; contacts do not fog up; contacts do not get in the way of activities; people feel they look better in contacts; and, contact lenses generally offer better sight. However, without the proper care and caution, contact lenses can be hazardous to your eyes. The chart presents important activities for you to add to your list of Do's and Do Not's associated with contact lens wear.

Do	**Do Not**
Follow Instructions.	Purchase lenses from beauty supply stores, nail and hair salons, convenience stores; do not purchase lenses through the Internet without a valid doctor's prescription.
Schedule follow-up visits with your eye doctor.	Use cream soaps or moisturizers before handling contacts.
Wash hands thoroughly before handling contacts.	Moisten lenses with saliva.
Store in a contact case.	Use homemade saline solutions.
Clean or discard dirty lens cases.	Share contacts.
Check lenses periodically for damage.	Sleep in your contacts.
Dispose of expired solutions.	

Contact an eye care professional if your vision becomes blurred or fuzzy, eyes are red and irritated, lenses are uncomfortable, or you experience pain in and around the eyes.

Cosmetic Lenses:
The growth and improvement in technology has led to improvements and developments in contact lenses. Lenses now are not only being produced to correct vision, but to change eye color and change the appearance of the eyes. The Food and Drug Administration cautions individuals against the use of decorative contact lenses that have not been prescribed and fitted by a qualified eye care professional. Cosmetic lenses purchased through beauty supply stores, nail and hair salons, convenience stores, and the Internet can result in corneal ulcers that can lead to infection; infection can cause corneal scarring and vision impairment and in extreme cases blindness and eye loss. The use of improperly prescribed

lenses also can result in conjunctivitis, corneal edema, allergic reaction, abrasion from a poor fit, and reduced visual acuity, contrast sensitivity, and can affect other visual functions, interfering with daily activities.

Symptoms of Eye Injury:
Any of the following symptoms may indicate a serious eye injury. If any of the following injuries occur, you should get immediate medical attention:

1. Obvious pain or vision problems;
2. Cut or torn eyelid;
3. One eye that does not move as completely as the other;
4. One eye that sticks out in comparison to the other;
5. Abnormal pupil size or shape;
6. Blood in the clear portion of the eye; and
7. Something in the eye or under the eyelid that cannot be easily removed.

If An Eye Injury Occurs:

- Do not rub the eye. Rubbing can lead to more damage.
- Protect the eye from the pressure of rubbing by taping a foam cup or similar shielding object against the bones surrounding the eye (brow, check, and bridge of nose).
- Do not apply ointment or medication to the eye. These products can slow the doctor ’s examination. They also may not be sterile.
- For punctures or cuts, bandage the eye preventing any pressure on the eye. Do not attempt to wash the eye or remove any object stuck in the eye. A paper cup can be used to protect the eye until an eye doctor is seen or the emergency room is visited.
- Immediately flush the eye with clean water for up to 15 minutes if a chemical burn occurs. Take the chemical and/or information on the chemical to the medical facility.
- Gentle application of small cold compresses will reduce swelling and pain from a blow to the eye until a medical professional is seen.
- Eyewash can be used to flush sand or small debris from the eye. If flushing does not remove the debris, lightly bandage the eye and seek the assistance of a medical professional. Do not rub the eye.
- Avoid the use of aspirin, ibuprofen, or other non-steroidal, anti-inflammatory drugs. These medications thin blood and can increase bleeding. They also may have no affect on the eye pain. Immediately see an eye care professional or go to the emergency room.

Eye Infection:
Although the eye has four natural defenses against infection: the eyelid, conjunctiva, cornea, and tears, eye infections do occur. The three most common eye infections are conjunctivitis, sties, and blepharitis. Conjunctivitis, also referred to as pink eye, causes a watery discharge or pus and crust on the eyelashes. Sties are pimple-like growths that appear at the base of the eyelashes. Blepharitis is an inflammation of the eyelids that appears as red scaly skin on the eyelids. These infections result from viral infections, bacterial infections, foreign substances, improperly fitted contact lenses, improper contact lens usage, and the use of cosmetic contact lenses that have not been purchased through a licensed eye care professional. Eye infections appear as redness, tearing, pain, sensitivity to light, blurry vision, the feeling of something in the eye, and/ or a scratchy feeling in the eye. If you are experiencing these symptoms, see an eye care professional or visit the emergency room. You can help to prevent eye infections by keeping clean hands, keeping your hands away from your eyes, and not sharing washcloths.

Nutrition & The Eye:
Healthy nutrition also is a means of protecting yourself from eye diseases. What you eat can help to protect you from having problems with your eyes later in life. The risk of cataracts and age-related macular degeneration can be reduced through the consumption of fruits and vegetables, such as spinach or collard greens, kale, turnip greens, broccoli, orange peppers, yellow corn, green peas, persimmons, and tangerines. These fruits and vegetables increase the carotenoids, lutein and zeaxanthin. In addition, fruits and vegetables high in antioxidants are believed to prevent cataracts and age-related macular degeneration.

Key vitamins including Vitamin A (Beta Carotene), Vitamin C (ascorbic acid), Vitamin E, Folic Acid, Selenium, and Zinc found in leafy green vegetables, carrots, citrus fruits, and melons also appear beneficial to eye health.

Ways to Protect Your Eyes:

- When working on the computer, you should take a break from looking at the computer screen every 30 minutes to give your eyes a rest. Sufficient sleep and rest allow you to use your eyes to the fullest. Tired eyes will affect your vision.
- Use care to wash your hands. If you rub your eyes with dirty hands, you can cause infection. Pink eye (conjunctivitis) is transferred through touch.
- If you get an eye injury, get immediate attention. Go to see an eye doctor or go to the emergency room.
- Only wear contact lenses you get from an eye doctor.
- Wear eye protection when playing sports – especially basketball, water sports, baseball, soccer, hockey and football.
- Eat healthy foods - especially fruits and vegetables.
- Protect your eyes from the sun with 98-100% UVA & UVB sunglasses or wide brimmed hats.
- Don't smoke. Smoking can increase your risk for cataract and age-related macular degeneration.

Key Points of Discussion:

- What things do you see in the classroom that could potentially injure your eyes?
- What things could happen on the playground to injure your eyes? How could you protect yourself from injury? **Keep fingers and any objects away from your eyes. Don't get too close to other children on the playground.**
- What things could happen at home to injure your eyes? How could you protect yourself from injury?
- **Do not run with forks, knives, combs, or toothbrushes.**
- **Carry scissors blade down.**
- **Keep all sharp and/or pointed objects away from your eyes, such as scissors, pencils, sticks, etc.**
- Read the Eyes and Their Care and discuss as a class.

National Science Education Standards
Science as Inquiry, Standard A (K-4) (5-8)
Physical Science, Standard B (K-4) (5-8)
Life Science, Standard C (K-4) (5-8)

National Health Education Standards
Standard 1 (K-4) (1, 3, 7, 8)
Standard 2 (K-4) (1, 2)
Standard 3 (K-4) (1, 4, 5, 6)
Standard 5 (K-4) (2, 4)

Ohio's New Learning Standards: K-12 Science:

Kindergarten :Earth and Space Sciences (ESS)
Weather changes are long-term and short-term.
The moon, sun and stars can be observed at different times of the day or night.

Kindergarten: Life Science (LS)
Living things have physical traits and behaviors, which influence their survival.

Kindergarten: Physical Science (PS)
Objects and materials can be sorted and described by their properties.

Grade 1: Earth and Space Science (ESS)
The sun is the principal source of energy.

Reading List

- **Take Care of Your Eyes** by Don L. Curry, 2005, Scholastic (for younger children).
  Describes the different parts of the eye and what each part does. Talks about why you should protect your eyes, how different parts of the eye serve as eye protection and what you should do if your eyes are hurt.

- **Sight** by Patricia Murphy, 2003, Children's Press (for younger children).
  Explores the sense of sight and the body parts used to produce it, including how to take care of your eyes (p.37).

- **Can You See the Chalkboard?** By Dr. Alvin Silverstein, V. Silverstein and L. Silverstein Nunn, 2001, Grolier Publishing (for older children).
  Describes the human eye and how it functions, various visual problems and how they are corrected, and how to take care of one's eyes.

- **I Need Glasses, My Visit to the Optometrist** by Virginia Dooley, 2002, MONDO Publishing (for younger children).
  Nick describes what happened when he went to the optometrist to get glasses.

Web Resources

Vision and the Eye:

American Ophthalmology Association Site with an Interactive Eye Illustration, Activity Sheets, and Lessons Plans:

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=TeachersCenter

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=ActivitySheet2

http://www.aoanet.org/eweb/DynamicPage.aspx?site=AOAstage&WebCode=ActivitySheet5

Prevent Blindness America
http://preventblindness.org

Glossary of Terms:
http://www.tedmontgomery.com/the_eye/glossary/A.html

Vision Learning Activities:
Exploratorium of Activities:
http://www.exploratorium.edu/snacks/
(See Science Snacks)

Realeyes: The Ohio Optometric Association's Education Initiative (for students (by grade level), teachers, and parents):
http://ooa.org/Intro.html

Vision Experiments and Activities for Children: Neuroscience for Kids:
http://faculty.washington.edu/chudler/neurok.html
(go to Explore the nervous system, then to Sensory systems)

Additional Downloadable Resources:

Vision: A School Program for Grades 4-8
National Eye Institute
http://www.nei.nih.gov/education/visionschool/index.asp

Wild About Healthy Vision: Activity Book for Ages 9-12
See All You Can See: Activity Book for Ages 6-8
US Dept. of Health and Human Services
National Institute of Health

National Eye Institute
http://www.nei.nih.gov/order/pub_sorted_by_title.asp

Other:
National Library of Medicine: Genetics Home Reference:
http://ghr.nlm.nih.gov/ghr/page/Home

Information on Health and the Body for Parents, Kids, and Teens:
http://www.kidshealth.org/

Medical Library with Information on Eye Health:
http://www.medem.com/MedLB/sub_detaillb.cfm?parent_id=30&act=disp.cfm

Activity Suggestions

- Create a list of hazardous materials in the home and/or school environment as a class or cut out pictures of hazardous materials from magazines.

- Write or discuss how to childproof the home or classroom.

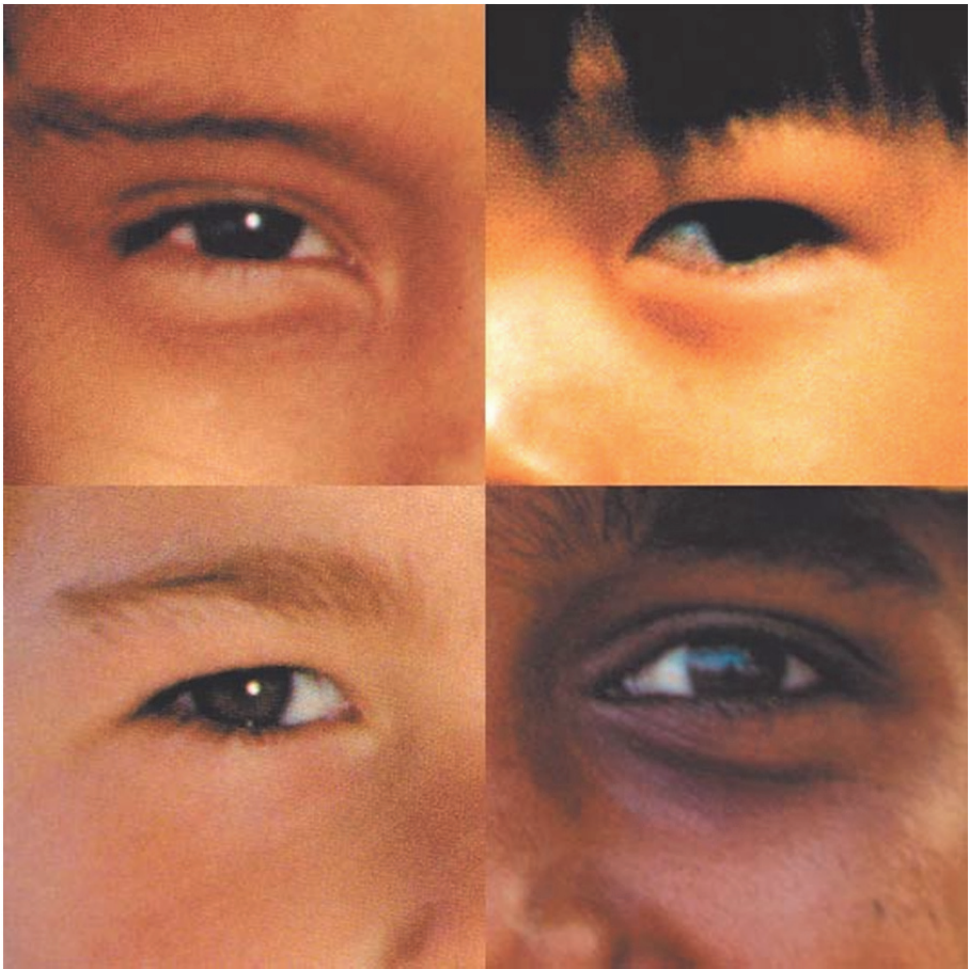
- Create a list or find pictures of all your favorite sports. Write or discuss how your eyes can be injured while participating in these sports. Write or discuss how you can protect your eyes while participating in these sports.

- Listen to a radio program or a book-on-tape and write down the differences between images you've formed through listening versus watching images on television.

- Practice getting dressed with your eyes closed. Discuss how this was more difficult and being able to pick out what you wanted to wear. Be sure to have an adult supervise you to prevent injury.

National Health Education Standards
Standard 1 (K-4) (8)
Standard 3 (K-4) (6)
Standard 5 (K-4) (2, 5)
Standard 7 (K-4) (1, 2, 3)

Play It Safe

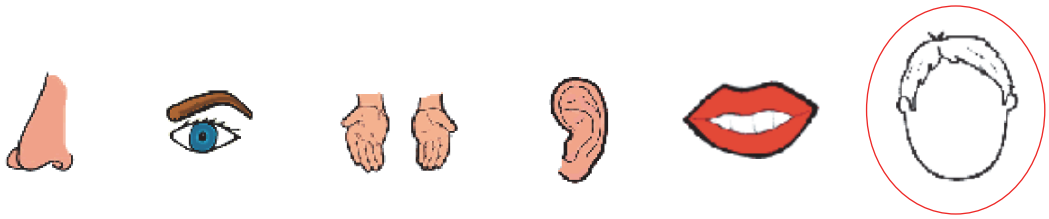


With Your Eyes

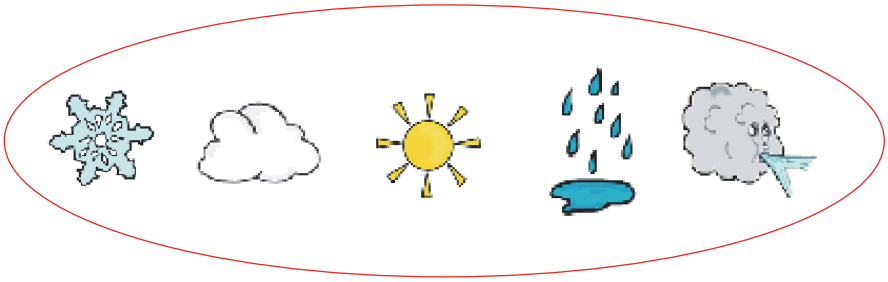
Resources

Kindergarten – Grade 2
Pre-/Post-Test

1. Which of the following is not one of your senses?

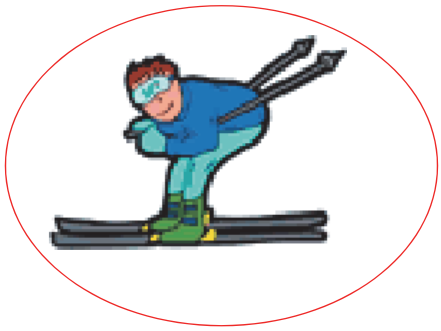


2. In what type of weather should you wear eye protection to keep your eyes safe?



(Students will demonstrate the ability to practice health-enhancing behaviors and reduce health risks.)

3. Which skier is wearing proper eye safety?

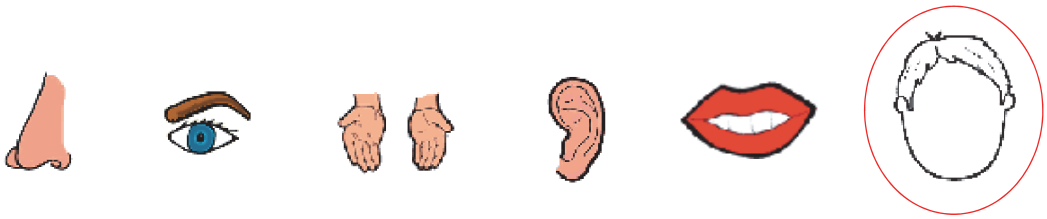


(*Students will demonstrate the ability to practice health-enhancing behaviors and reduce health risks.*)

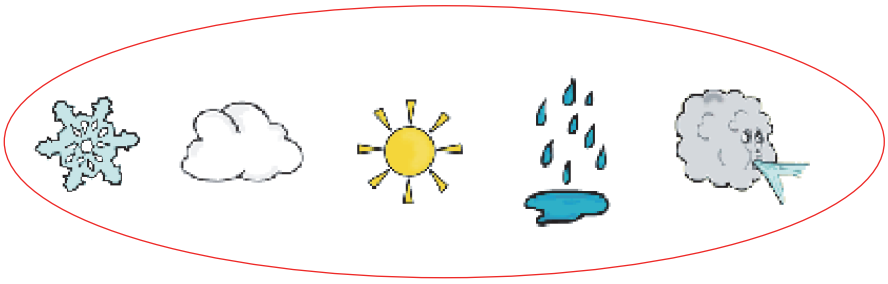
Name: _____
Teacher: _____
Class: _____
Date: _____

Pre-/Post-Test

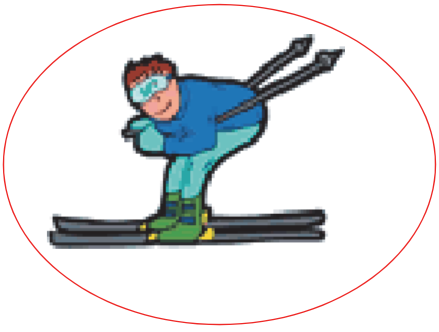
1. Which of the following is not one of your senses?



2. In what type of weather should you wear eye protection to keep your eyes safe?



3. Which skier is wearing proper eye safety?



Homemade Play Dough Recipes

Play Dough:

- 1 cup of flour
- 1/2 cup of salt
- 1 cup of water
- 2 tablespoons of oil
- 2 teaspoons of cream of tartar

Mix all ingredients together in a sauce pan. Cook over medium heat until lumpy. Empty pan out onto table top and knead until smooth. Add food coloring.

Peanut Butter Play Dough:

- 2 cups of peanut butter
- 2 cups of powdered milk
- 3 tablespoons of honey
- 2 tablespoons of oil
- 2 teaspoons of cream of tartar

Mix all ingredients together in a medium size bowl. If too sticky add more powdered milk, one tablespoon at a time.

No-Cook Dough:

- 2 teaspoons of cooking oil
- 1 cup of salt
- 1 1/4 cup of water
- 2 tablespoons of corn starch
- 2 cups of flour

Mix oil, salt, and water together in a large size bowl. Gradually add corn starch and flour. Knead until smooth. Divide dough into parts and add food coloring. Add small amounts of water if dough is dry, or flour if dough is too sticky.

Kool-Aid Play Clay:

- 1 cup of flour
- 3 tablespoons of corn oil
- 1/4 cup of salt
- 1 small package of unsweetened Kool-Aid
- 1 cup of boiling water

Mix all ingredients together and then add 1 cup of boiling water. Stir and knead mixture until it forms a soft dough.

On-Line Educational Resources

WebQuests

Webquests are valuable resources in that they can encourage children to take a more active role in the learning process and to proceed beyond the knowledge and comprehension levels as identified in Bloom's taxonomy. Webquests are easy to easy to use and are readily worked into a unit of study. In addition, webquests often contain items of value for the teacher including activities, assessment tools, and background information. To view webquests on vision, visit any of the sites listed below:

"Eye Site" – includes information on a variety of vision related content as well as games, activities, and quizzes. http://library.thinkquest.org/J002330

"The Perception of Vision: Your Eyesight" – similar to the "Eye Site", but activities have more appeal to slightly older children. http://library.thinkquest.org/C005949

"Optical Illusions: Seeing Isn't Always Believing" – includes excellent information on perception and optical illusions as well as a large bank of examples and activities.
http://www.library.thinkquest.org/J0110336/main.htm

"Feeling Like You Need Another Pair of Eyes? The Wonderful World of Glasses" – includes some eye anatomy as well as the history of glasses, why some people wear them, and interviews with doctors and eyeglass wearers. http://library.thinkquest.org/J002508

"Five Senses Webquest" – this webquest covers body systems as well as the sense of sight as part of a five senses webquest; students are challenged to create their own webquest; contains several resources for teachers. http://www.wyndmere.k12.nd.us/web/html/bodysys/bswq.htm

Additional On-line Resources

"Wise About Eyes" – This Prevent Blindness Ohio site provides access to activities and information for children, parents, health care professionals and educators about children's eye health and safety. http://www.wiseabouteyes.org

"Bill Nye the Science Guy on Eyeballs" – this site accesses an episode where Bill Nye talks about the human eye. http://www.billnye.com/episode_pdfs/episodeguide20.pdf

"Kids Health" – excellent interactive that covers the basics of eyesight and eye health. http://www.kidshealth.org/kid/body/eye_SW.html

"Exploratorium, Cow's Eye Dissection" – a how to guide on cow's eye dissection that includes support materials. http://www.exploratorium.edu/learning_studio/cow_eye/index.html

"Yucky Kids" – interactive site including eye anatomy and eye health. http://yucky.kids.discovery.com/flash/body/pg000142.html

"Get Focused" – A classroom curriculum on the eye for grades K - 6. The curriculum can be downloaded at no cost, or teachers may request a hard copy. http://getfocusedamerica.org/

"See All You Can See" (ages 6 – 8) and "Wild About Health Vision" (ages 9 – 12)
Eye health and safety activity books available at no cost from the National Eye Institute.
http://www.nei.nih.gov

Helping Parents/Guardians

Objective:

- Parents/guardians will learn three to six ways they can help to protect their children(s) vision.

Activities:

1. Conduct a parents'/guardians' program, inviting them to a presentation by a local ophthalmologist or optometrist. Subjects to be addressed could include the development of children's vision, visual disorders, signs of possible eye trouble, vision screening, eye safety, and first aid for eye injuries.
2. Check with the school nurse to have students' vision screened.
3. Send home a parent/guardian letter describing eye hazards and safety tips at home.
4. Distribute sight-saving tips to parents/guardians.
5. Discuss the various eye problems of children.
6. Discuss the signs of possible eye trouble in children.
7. Discuss first aid for eye emergencies.

Prevent Blindness Ohio®
Our Vision Is Vision™

Dear Parent/Guardian:

Next week your child will be learning about eye health and safety. We will be studying a curriculum published by Prevent Blindness America.

Since many vision problems begin at an early age, it is very important that children receive proper eye care. Untreated eye problems can become worse and lead to other serious problems, affecting the child's ability to learn as well as his/her personality and self-image.

Most children believe that the way they see is the same way that everyone sees, even if their vision is blurred, double, or through only one eye. Although some problems can be detected through a child's behavior, the best way to find out if a child has normal vision is through screening programs and regular eye exams.

Eye injuries also are a serious problem for many youngsters. Too many of us don't think about the many things in our homes that pose risks to our children's eyes.

To find out how much you know about protecting sight and preventing blindness, take this simple quiz.

What is your Eye Q?

1.	One person in the world goes blind every 11 minutes.	T	F
2.	More than 11 million Americans are visually impaired.	T	F
3.	One in every four school-age children has a vision problem.	T	F
4.	Ninety percent of all eye injuries can be prevented.	T	F
5.	Nearly 50 percent of all eye injuries occur in the home.	T	F
6.	Nearly half of all blindness can be prevented.	T	F

In fact all of the above statements are true. When you know the facts about taking care of your eyes, you've taken the first step toward having healthy vision for a lifetime.

Here are some safety tips that can help prevent home eye accidents from happening to your child.

Bathroom and Kitchen

- Teach students to walk, not run, with forks, knives, or other sharp objects.
- Put detergents and other cleaning products behind locked doors or out of children's reach.
- Set a good example by wearing eye protection when doing tasks that are potentially hazardous, such as cleaning the oven or using cleaning solutions that have an ammonia base.

Bedroom

- Make sure clothes hangers stay in the closet.
- Remove small, pointy, or broken toys.
- Young children should not be allowed to play with hairspray, brushes, or combs without supervision.

Play Area

- Teach children to put toys in their proper place.
- Keep toys intended for older children away from younger ones.
- Remind children not to throw toys or other objects at each other.

Yard and Garden

- Keep children away from the area when using lawn equipment or snow removal equipment, such as lawn mowers, weed or hedge trimmers, or snow blowers/throwers.
- Check lawn for rocks, sticks, or other debris before mowing.
- Always wear safety glasses when using lawn equipment, fertilizers, and pesticides.

Workshop

- Place nails, glue, screwdrivers, and other tools out of a child's reach.
- Keep young children away from areas where power tools are being used.
- Set a good example by always wearing eye protection when working with equipment.

Backyard Games

- Encourage children to wear appropriate eye protection when playing baseball, basketball, or other contact sports.
- Make sure children who wear prescription glasses do not play contact sports without proper eye protection.
- Work together to develop a list of eye safety rules that they can follow when playing.

Additional sight-saving tips include:

1. Get regular professional eye exams.
2. Report changes in your eyes or vision to your doctor.
3. Learn first aid for eye injuries.
4. Follow your doctor 's instructions on contact lens care and use.
5. Wear protective eyewear (safety glasses or goggles).
6. Protect your eyes from the sun's harmful rays.
7. Follow instructions on warning labels; select products that are safe, easy to use, and may be disposed of easily.
8. Wear seat belts and restrain children in car seats.
9. Keep all hazardous products properly stored in a secure area and out of the reach of your children.
10. Leave fireworks to the professionals.

Prevent Blindness America®

211 West Wacker Drive
Suite 1700
Chicago, Illinois 60606
1-800-331-2020
www.preventblindness.org

Eye Safety Tips For Your Home

Most people don't know there are many common objects in the home that can cause serious eye injuries to children. Watching children is the best precaution, but there are other steps you can take to ensure their safety and well-being. Teaching kids about eye safety is one way. Using eye protection for risky tasks is another.

Actions often speak louder than words. Adults who wear eye protection are teaching their kids a valuable lesson. In addition, the following home safety tips can help keep you and your children safe.

Bathroom and Kitchen

- Teach children not to run around with forks, knives, combs or toothbrushes.
- Keep detergents, cleaning supplies, nail polish remover, mouthwash and makeup in locked cabinets or out of reach.
- Set a good example by wearing eye protection when using ammonia-based cleaning supplies.

Bedroom

- Keep clothes hangers in the closet.
- Don't allow children to play with small, pointed or sharp toys or objects in bed.
- Don't allow young children to use combs, brushes or hairspray unless you watch or help them.

Play Area

- Teach children to put toys away.
- Keep toys for older kids away from younger kids.
- Don't give toys with small parts to young children. Young kids tend to put things in their mouths, increasing the risk of choking.
- Tell children not to throw toys or objects at each other.

Founded in 1908, Prevent Blindness America is the nation's leading volunteer eye health and safety organization dedicated to fighting blindness and saving sight. Focused on promoting a continuum of vision care, Prevent Blindness America touches the lives of millions of people each year through public and professional education, advocacy, certified vision screening training, community and patient service programs and research.

- Repair or throw away broken toys. Take recalled toys back to the store where you bought them.

Workshop/Basement

- Place nails, glue, screwdrivers and other tools out of reach of children.
- Keep younger children away from work areas where power tools are being used.
- Set a good example by always wearing eye protection while working on projects.
- Prompt others who enter the work area to wear eye protection.

Call the PBA Vision Health Resource Center at 1-800-331-2020.

Backyard Games

- Teach kids to wear the right eye protection when playing baseball, basketball or other types of contact sports. Call PBA at 1-800-331-2020 to get a list of the recommended eyewear for specific sports.
- Make sure children who wear prescription glasses play contact sports with proper eye protection.
- Work together with your kids to create a list of eye safety rules they should follow when they are playing.

Prevent Blindness America

211 West Wacker Drive
Suite 1700
Chicago, Illinois 60606
1-800-331-2020
www.preventblindness.org

Planning a Trip to the Eye Doctor?

Prevent Blindness America recommends a continuum of eye care for children to include both vision screening and comprehensive eye examinations. All children, even those with no signs of trouble, should have their eyes checked at regular intervals. Any child who experiences vision problems or shows symptoms of eye trouble should receive a comprehensive eye exam by an optometrist or an ophthalmologist. If you are planning to take your child to the eye doctor, here are some helpful tips.

1. Ask your relatives, friends and neighbors if they know the name of an eye doctor who is good with children.

2. Schedule the appointment when your child is not likely to be sleepy or hungry. If your child has a "cranky" time of day, schedule around it.

3. Make a list of your questions and bring it with you. Take notes when speaking to the doctor, so that you can refer to them later.

4. Have a plan ready in case you need to spend time in the waiting room. Bring a favorite storybook, coloring book or small toy that your child can play with quietly. A snack can also help to pass the time.

5. Let your child watch a family member get an eye exam. Have the doctor explain what is being done, step by step, and encourage the child to ask questions.

6. Bring your child's favorite cuddly toy. The doctor can "examine" the bear or doll and holding a toy may keep little hands off of expensive equipment.

7. Relax. Children look to adults for cues: if you seem nervous, your child may become anxious. A trip to the eye doctor should be fun for both of you.

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WHO'S WHO IN EYE CARE

Who's Who In Eye Care?

You may contact several types of specialists to help with questions and problems about your eyesight. The following lists only some of the eye care specialists available. These are the definitions given by each professional organization. For a complete listing, please call Prevent Blindness America at 1-800-331-2020.

Ophthalmologists

Definition provided by the American Academy of Ophthalmology. For more information, contact the AAO at (415) 561-8540.

An ophthalmologist is a physician (doctor of medicine or doctor of osteopathy) who specializes in the comprehensive care of the eyes and visual system in the prevention of eye disease and injury. The ophthalmologist has completed four or more years of college premedical education, four or more years of medical school, one year of internship and three or more years of specialized medical and surgical training and experience in eye care. The ophthalmologist is a physician who is qualified by lengthy medical education, training and experience to diagnose, treat and manage all eye and visual system problems, and is licensed by a state regulatory board to practice medicine and surgery. The ophthalmologist is the medically trained specialist who can deliver total eye care: primary, secondary and tertiary care services (i.e., vision services, contact lenses, eye examinations, medical eye care and surgical eye care), and diagnose general diseases of the body.

Optometrists

Definition provided by the American Optometric Association. For more information, contact the AOA at (314) 991-4100.

Doctors of optometry (optometrists) are independent primary health care providers who specialize in the examination, diagnosis, treatment and management of

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diseases and disorders of the visual system, the eye and associated structures, as well as the diagnosis of related systemic conditions. The optometrist has completed pre-professional education at a college or university, four years at a college of optometry and, in some cases, a residency. Doctors of optometry are specifically trained and state licensed to provide primary eye care services. These services include comprehensive eye health and vision examinations; diagnosis and treatment of eye diseases and vision disorders; the prescribing of glasses, contact lenses, low vision rehabilitation, vision therapy, drugs and medications and the counseling of patients regarding their vision needs as related to their occupation, avocations and lifestyles.

Opticians

Definition provided by the Opticians Association of America. For more information, contact the OAA at (703) 691-8355.

Opticians are professionals in the field of designing, finishing, fitting and dispensing of eyeglasses and contact lenses, based on an eye doctor's prescription. The optician may also dispense colored and specialty lenses for particular needs as well as low-vision aids and artificial eyes.

Certified Ophthalmic Registered Nurses

Definition provided by the American Society of Ophthalmic Registered Nurses. For more information, contact ASORN at (415) 561-8513.

A certified ophthalmic registered nurse is a registered nurse who has a specialized body of knowledge, skills and experience. Ophthalmic nurses perform ophthalmic examinations, patient assessments based on human responses to ophthalmic diseases, triage, teach patients about their ophthalmic conditions and prevention, assist in eye surgeries and provide emotional support to patients and their families. Ophthalmic registered nurses work in operating rooms, ambulatory clinics, private offices and hospitals. The goal of ophthalmic nursing is to assist patients in preserving and maximizing the vision that they have, prevent disabling eye disease through education, promote independence, and enhance the patient's quality of life. Eligibility for certification (CRNO) requires two years of practice in ophthalmology before taking the written examination.

Certified Orthoptists

Definition provided by the American Association of Certified Orthoptists. For more information, contact Jill Clark at (912) 285-2020.

The orthoptist, an allied health professional in ophthalmology, works in an adjunctive capacity with an ophthalmologist in the diagnostic and therapeutic assessment of children and adults with strabismus, amblyopia, diplopia and disturbances of binocular function. Expert in the visual assessment of nonverbal patients and in the performance of diagnostic tests used to evaluate visual function, the orthoptist may also be skilled in refraction, visual field testing, electrophysiologic testing, contact lens evaluation and low vision assessment.

Certified Ophthalmic Personnel

Definition provided by Joint Commission on Allied Health Personnel in Ophthalmology. For more information, call 1-800-284-3937.

These individuals, such as Ophthalmic Assistants, Ophthalmic Technicians and Ophthalmic Medical Technologists, are qualified to assist the ophthalmologist in a variety of procedures, from history taking and basic tonometry to visual field testing and ophthalmic photography, depending on the level of certification. Certification in the subspecialty areas of Ophthalmic Surgical Assisting and Assisting in Low Vision are also available. The Joint Commission on Allied Health Personnel in Ophthalmology is the certifying agency.

Paraoptometric

Definition provided by the American Optometric Association. For more information, contact the AOA at (317) 991-4100.

The paraoptometric may assist the optometrist in providing primary patient care examination and treatment services, including contact lenses, low vision, vision therapy and optical dispensing and office management. State laws may limit, restrict or otherwise affect the duties that may be performed by the paraoptometric.

Optometric Assistant

Definition provided by the American Optometric Association. For more information, contact the AOA at (314) 991-4100.

The optometric assistant may be trained on the job or may have completed a formal education program that is less than one academic year in length and successfully completed the National Optometric Assistant Registry Examination. A registered optometric assistant will be designated by Opt. A., R.

Optometric Technician

Definition provided by the American Optometric Association. For more information, contact the AOA at (314) 991-4100.

Technicians work directly with optometrists in the areas of patient examination and treatment, including contact lenses, low vision, vision therapy, optical dispensing and office management. The optometric technician may have completed a college program in optometric technology that is a minimum of one academic year in length, or career ladder to the position by successfully completing the Optometric Technician Registry Examination. A registered optometric technician will have the Opt. T., R. designation.

Call the PBA Vision Health Resource Center at 1-800-331-2020 for more information on eye care

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CHILDREN'S VISION SCREENING

Why is children's vision screening so important?

- Lazy eye (amblyopia) is preventable, but is still the leading cause of monocular blindness in children.[1]
- An estimated one in 20 preschoolers has a vision problem that could lead to permanent vision loss due to amblyopia, if left untreated.[2]
- An estimated one in four school-aged children has a vision problem.[2]
- Unresolved vision deficits can impair the ability to respond fully to educational instruction.[3]

Yet, unfortunately ...

- Only about 20% of preschool children have their vision screened through government and private screening programs.[1]
- Pediatricians have been reported to attempt vision screening in only two-thirds of all of their preschool patients, and in only 38% of their 3-year-old patients.[4]
- Only an estimated 14% of children receive comprehensive vision examinations before entering school.[5]

Why is Prevent Blindness America at the forefront of screening children?

- Prevent Blindness America (PBA) has been a pioneer and leader in children's vision screening since the 1920's.
- PBA is the nation's largest private screener of children's vision. We screened more than 2 million children in 2002-2003.
- PBA is the only national organization that offers standardized vision screening training and certification programs to screening personnel. We've trained and certified thousands of people across the country.

PBA's children's vision screening methods are among those recommended by:

- **The American Academy of Ophthalmology**[6]
- **The American Association of Pediatric Ophthalmology and Strabismus**[6]
- **The U.S. Maternal and Child Health Bureau and National Eye Institute Task Force on Vision Screening in the Preschool Child**[7]

Founded in 1908, Prevent Blindness America is the nation's leading volunteer eye health and safety organization dedicated to fighting blindness and saving sight. Focused on promoting a continuum of vision care, Prevent Blindness America touches the lives of millions of people each year through public and professional education, advocacy, certified vision screening training, community and patient service programs and research.

Prevent Blindness America's children's vision screening (CVS) program

Prevent Blindness America's (PBA's) children's vision screening (CVS) program is aimed at detecting amblyopia and amblyogenic conditions, although many less serious problems are most often detected. No screening program can find every possible vision problem, but the CVS program provides an important safety net for those children most at risk of permanent vision loss. Screening is not a substitute for a professional eye exam—all parents are reminded of the need for periodic professional eye care for their children, regardless of the results of their child's vision screening.

The screening consists of observation for any appearance, behavior or complaint that might suggest a vision problem, a distance visual acuity test with age-appropriate techniques, and a Random Dot E test of stereopsis. Photoscreening may be used for children unable to cooperate with these tests.

In 2003-2004, PBA screened more than 2 million children in 22 states. An average of 9% of these children were referred for possible eye problems detected during their screenings.

PBA's CVS program is cost effective. Our average cost to screen a child is only about $5.00. Actual costs can vary due to a number of local factors.

Prevent Blindness America partners with Vision Service Plan (VSP), providing free eyeglasses and eye exams to children through the *Sight for Students* program. Families not receiving any government assistance, but who are unable to afford services are eligible. Each year, Prevent Blindness affiliates distribute thousands of vouchers, worth close to $2 million in services.

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QUICK FACTS: CHILDREN'S EYE PROBLEMS

More than 12.1 million school-age children, or one in four, has a vision impairment. Among preschool-age children, more than one in 20 has a vision problem that can cause permanent sight loss if left untreated. The most common types of eye problems seen in children are:

- Myopia (nearsightedness)
- Strabismus (crossed eyes)
- Lazy Eye (amblyopia)

The most common causes of blindness among children are: congenital cataracts, retinopathy of prematurity and other complications caused by premature births.

Hospital emergency rooms treat thousands of children each year who suffer from eye injuries in and around the home. In general, the most common causes of eye injuries to children age 14 and younger are caused by:

- Toys not suitable for the child's age or abilities, and broken toys
- Pens and Pencils
- Adhesives
- General Household Cleaners
- Furniture
- Flatware and Table Settings
- Non-Cosmetic Bleaches
- Cigarettes, Cigars, Pipes, Lighters
- Grooming, Cosmetics (Hair Care, Makeup)
- Paper and Cardboard Products

Each year, thousands of children suffer serious eye injuries while participating in sports. Wearing protective eye wear can help prevent nearly all of these injuries. The sports associated with the most injuries in children age 14 and younger:

- Baseball/Softball
- Water and Pool Activities
- Guns - Air, Gas, Spring, BB
- Basketball
- Ball Sports (unspecified)
- Bicycles

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- Football
- Winter Sports (Skiing, Hockey, Ice Skating, Snowmobiling, etc.)
- Racquet Sports

About 90% of all eye injuries and 50% of all cases of blindness are preventable. You can help protect your child's sight by being aware of risks and taking proper precautions.

A child's eyes should be checked shortly after birth, before starting school (age 3 or 4), and throughout the school years as needed.

Regular eye care is important even when your child shows no signs of eye trouble.

For a free copy of Prevent Blindness America's *Children's Eye Health Position Statement*, call 1-800-331-2020 or visit www.preventblindness.org.

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Lazy Eye (Amblyopia)

What is lazy eye?

Lazy eye, or amblyopia, is loss of vision in eyes that is not corrected by glasses. It is a condition that starts in childhood. More than one in 50 children have amblyopia. If not treated, it can cause lifelong vision loss in the problem eye.

Amblyopia has many causes. Most often, it results when a child has crossed eyes or eyes that don't line up. One eye that focuses better than the other can also cause amblyopia. One in 20 preschool children has an eye problem that could cause amblyopia.

In both cases, one eye becomes stronger. The strong eye takes on more of the job of seeing while the weak eye is used less. If the problem is not treated, the weak eye will be able to see less and less, and vision gets worse.

You can protect your child from vision loss caused by amblyopia if you:

- Look for signs of lazy eye
- Have your child's vision checked one eye at a time

What are the signs of lazy eye?

Many different problems can cause lazy eye. Here are some signs of eye trouble that could be related to lazy eye or other eye problems:

- Favoring one eye
- Tilting the head
- An eye drifts or wanders when the child is tired, sick or in bright light
- Your child tends to close one eye, especially in sunlight
- Rubbing the eyes
- Your child seems to blink too much
- Your child holds things close to his or her eyes

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If you notice these or other signs of eye trouble, take your child to an eye doctor right away.

Some children with eye problems may show no signs of eye trouble!

Have your child's eyes checked

Remember, treatment works best when lazy eye is found early. A child's eyes should be checked:

- Shortly after birth
- Before starting school (age 3 or 4)
- Throughout the school years as needed

Regular eye care is important even when your child shows no signs of eye trouble.

How does an eye doctor treat lazy eye?

First, a doctor must treat the cause of amblyopia. Here are some common treatments:

- Glasses can correct focus or help eyes that are not lined up.
- Surgery on eye muscles can help straighten the eyes if other treatments don't work. Surgery can help both eyes work together.
- Eye exercises may help the weak eye see better.

Along with treating the cause, the doctor must help the weak eye grow strong again. There are several ways to do this:

- Patching or covering the strong eye makes the "lazy eye" work harder. Your child may need to wear an eye patch for a few weeks or many months.
- Your child will have to visit the eye doctor regularly to see if the weaker eye is getting stronger. Patching works best in early childhood, but a doctor may recommend patching at any time.
- Medicine such as eye drops or ointment can be used instead of patching in some cases to blur the vision in the stronger eye.
- Glasses or contact lenses can also be used to blur vision in the strong eye, helping the weak eye work harder.

Support your child's treatment

If you have a child with amblyopia, he or she may be frustrated with treatment such as patching. Understand the problem, and be patient. The Eye Patch Club™, a support program for children with amblyopia and their families, can be a big help. Call 1-800-331-2020 to receive a free copy of Prevent Blindness America's *Children's Eye Health Position Statement.*

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Strabismus (Crossed Eyes)

What is strabismus?

Strabismus is a word for eyes that are not straight or do not line up with each other. This problem is caused when the muscles of the eyes do not work together.

About one in 50 children in America has strabismus. Half of these children are born with the condition. An illness or accident may also cause strabismus. If the problem is not found and treated early, it may lead to lazy eye (amblyopia)—a loss of vision that has not been corrected by glasses.

Why can strabismus cause vision loss?

To develop normal vision, a child needs two healthy eyes, both with good vision, that work well together.

If the muscles of both eyes don't work together, your child's brain may begin to ignore images from the eye that is not looking directly at the object. When the brain ignores visual information from one eye, that eye will not develop good vision. Strabismus may also affect your child's personality. A cosmetic defect that makes a child look different may cause feelings of embarrassment.

How do I know if my child has strabismus?

- Look for signs that your child's eyes do not line up
- Have your child's eyes checked

For more information, call the PBA Vision Health Resource Center at 1-800-331-2020

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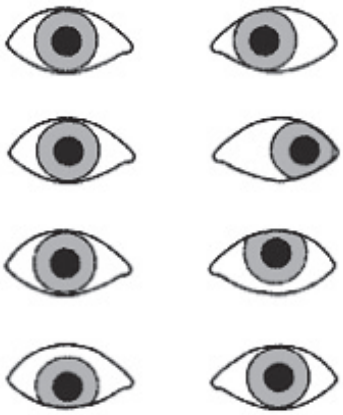
Look for signs that your child's eyes do not line up

A child with strabismus may have eyes that look like one of these pictures:



1. Turned in **2. Turned out**
3. Turned up **4. Turned down**

Have your child's eyes checked

Remember, treatment works best when lazy eye is found early. A child's eyes should be checked:

- Shortly after birth
- Before starting school (age 3 or 4)
- Throughout the school years as needed

For a free copy of Prevent Blindness America's *Children's Eye Health Position Statement*, call 1-800-331-2020 or visit www.preventblindness.org.

How do eye doctors treat strabismus?

Strabismus may be caused by many different problems, including injuries, unbalanced eye muscles, a need for glasses, illnesses or eye tumors.

Strabismus does not improve by itself. Treatment to straighten the eyes is needed. An eye doctor may use the following treatments alone or in combination to treat strabismus. The choice depends on the type of strabismus and its cause.

Glasses
Glasses can improve focus and may help straighten the eyes.

Patching
The doctor may take steps to help the child use the weaker eye. The child may have to cover the stronger eye with a patch to strengthen the weaker eye.

Medicine
Medicine in the form of eye drops or ointment can blur vision in one eye. This treatment may be used instead of patching. Different drops may be used to replace glasses or to add to the strength of glasses.

Surgery
Surgery on the eye muscles may help straighten the eyes.

Eye exercises
A doctor may recommend eye exercises for strabismus before or after surgery.

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EYE PATCH CHOICES

Selecting the right eye patch for your child with lazy eye (amblyopia) can help ensure the success of treatment. However, it is most important that you consult your child's eye doctor in making this selection since every patch may not be right for every child and some patches may not be right for treating amblyopia.

Adhesive Patches

There are at least two brands of adhesive eye patches commonly available over-the-counter in drug stores and other retail establishments:

Coverlet® Eye Occlusor
Beiersdorf Inc.
Wilton, CT 06897

Nexcare™ Opticlude™ Orthoptic Eye Patch
3M Health Care
3M Center, Building 275-5W-05
St. Paul, MN 55144
800-537-2191 (phone)

Non-Adhesive Patches

Several alternatives to adhesive patches are available. Many of these are made by small businesses, some of which were started by parents of children with amblyopia. Some are cloth patches for wear over the eye, while others are eyeglass lens occluders.

iPatch
190 W. Grayling Drive
Fairlawn, OH 44333
www.goipatch.com

Little Patches
Joanne Kelley
5 Jackson Court
Newport, RI 02840
401-845-9282 (phone)

"Max Patch"
King Grafix
1906 West Side Highway
Kelso, WA 98626
360-423-9781 (phone)
www.kinggrafix.com/products/maxpatch.html

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PatchPals
P.O. Box 26
Hiawatha, IA 52233
319-393-4657 (phone)
www.patchpals.com

PatchWorks
7655 Scribner Drive
Citrus Heights, CA 95610
916-726-9649 (phone)
getapatch@aol.com (email)

The Eyes Have It
SoJac Enterprises
P.O. Box 607
Carlisle, PA 17013
717-960-9091 (phone)
sojacenterprises@aol.com (email)

Prevent Blindness America does not endorse or promote specific products and cannot comment on the appropriateness of these patches for any given use. This list is provided for informational purposes only and is not comprehensive. Please consult your eye doctor before selecting or changing your child's eye patch.

Call the PBA Vision Health Resource Center at 1-800-331-2020 for more info about the Eye Patch Club®

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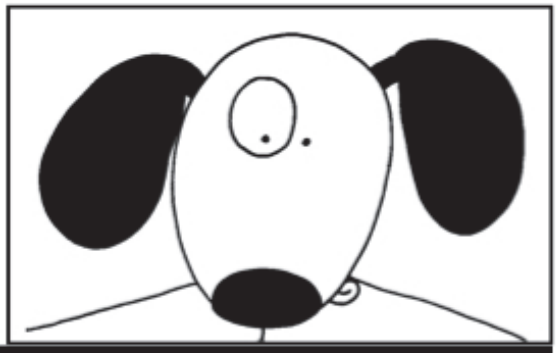


TEN REASONS TO JOIN THE EYE PATCH CLUB®

Compliance with patching for your child with lazy eye (amblyopia) will help insure the success of treatment, but it is not always easy. The Eye Patch Club®, a support group for children with amblyopia and their families, has helped hundreds of members since 1998. The club offers fun activities and incentives to help parents and children cope with amblyopia. Below are compelling testimonials from 10 parents.

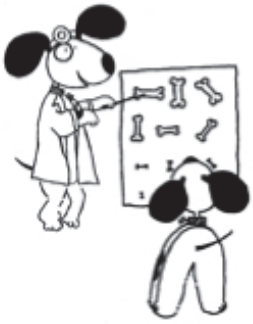
The Eye Patch Club curriculum helped my daughter's teacher easily explain about eyes, glasses and patching. It helped the adults explain things to children in a positive manner. Now that we were able to get everyone's questions answered up front, the kids aren't staring at my daughter out of curiosity. Thank you! Your curriculum helped make for an easy transition. *** Marion C.

Just great to know there are resources! Have used the curriculum with my son's class—great! *** Cheryl P.

THANK YOU! This is such a great motivational tool! *** Joan K.

I wish I knew about this club earlier. It is great!! My daughter enjoys it and has learned lots. *** Glenda B.

My 3-year-old daughter was diagnosed with amblyopia recently. I could not imagine having to deal with patching my daughter, knowing her strong personality. I only imagined fights every day. I ordered The Eye Patch Club information and read some of the forum conversations searching for ideas. Well, all has gone very well. Not one fight or struggle. The calendar was a great way to start the process, and the tips in the newsletter were very helpful. I want to thank you for having The Eye Patch Club available.



*** Ruth M.

A job well done. I have already sent the information to two of my friends. ***

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Debra A.

By answering kids' questions and explaining amblyopia, kids and adults respond positively. School started one week ago and my son hasn't been teased at all! ••• Julie B.

Aron loves Patch and we have found a dog like Patch for him to cuddle. The photos of kids with patches were really important—now he knows he's not alone. ••• Gilly C.

As a mother, I am so glad I have a resource to help us through this situation. Thanks! ••• Kim P.

The club calendar is incredible—my daughter couldn't wait to do it every night. I am so happy to have had it. Thank you. ••• Barrie R.

When you join The Eye Patch Club, you receive The Eye Patch Club Kit, containing:

- **The Eye Patch Club News** is a newsletter featuring tips and techniques for promoting compliance; stories from and about children who are patching; and helpful advice from eye care professionals. Each issue also includes a **Kids' Page**, with fun games and puzzles for your child. The first issue is included in the kit and the other five issues will be sent to you monthly.
- **Classroom Guide** helps your child's teacher. Sometimes kids who wear patches worry that friends at school will make fun of them. The guide explains everything to the teacher and classmates, and gives them ideas for fun activities to help everyone learn more about their eyes.
- **Calendar and stickers** for each day of wearing the patch as prescribed, so that your child gets to put a sticker on the calendar. When the calendar is full, send it back to Patch and the pup will send your child a cool, colorable, iron-on decal featuring Patch.
- **Refrigerator sticker** will help remind you about Patch's helpful hints everyday.
- **Pen Pal form** so children in treatment can share their stories with other members of The Eye Patch Club.

Call the PBA Vision Health Resource Center at 1-800-331-2020 to learn more

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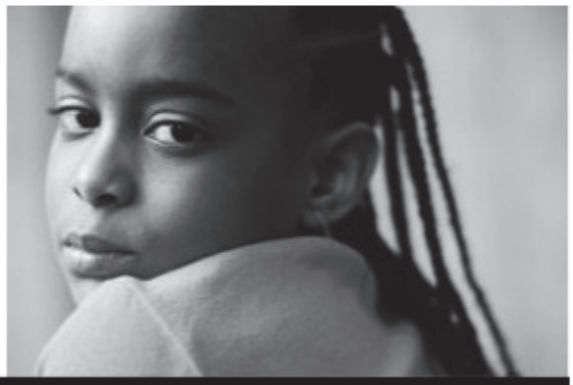

MOST DANGEROUS TOYS TO CHILDREN'S EYES

In 2003, thousands of children age 14 and younger suffered serious eye injuries, even blindness, from toys. Many of these injuries were caused by guns—both toy and recreational, and playground equipment. This is what Prevent Blindness America recommends: Protect your children's eyes by not buying them guns or toys not meant for their age. You can also keep your children safe by showing them how to use toys, and if necessary, by watching them when they play. Below are toys linked with the most eye injuries in children age 14 and younger.

	NUMBER OF EYE INJURIES
TOY WEAPONS	
Guns: Air, BB & Spring	1,293
Toy Weapons (combined types)	325
Slingshots and Sling-propelled toys	110
	1,728
OTHER TOY PRODUCTS	
Toys (other and unclassified)	4,371
Fireworks (classified as toys)	802
Playground Equipment	733
Bicycles	558
Art Supplies and Crayons/Chalk	386
Trampolines	240
Scooters, Skateboards, Powered Riding Toys	171
Go-Carts	170
Toy Sports Equipment	155
All other categories combined	736
TOTAL	**10,050**

(Turn Please)

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Table source: Prevent Blindness America. Based on statistics provided by the U.S. Consumer Product Safety Commission, Directorate for Epidemiology; National Injury Information Clearinghouse; National Electronic Injury Surveillance System (NEISS). Product Summary Report—Eye Injuries Only—Calendar Year 2003. NEISS data and estimates are based on injuries treated in hospital emergency rooms that patients say are related to products. Therefore, it is incorrect when using NEISS data to say the injuries were caused by the product.

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Tips For Choosing Safe Toys

The right toy can help build imagination and coordination, but the wrong toy can do more harm than good.

Prevent Blindness America reports that in 2003, there were more than **10,000 eye injuries** to children 14 and younger related to toys and play activities. Further, **90%** of these injuries were preventable.

While many toy makers follow mandatory and voluntary safety guidelines for their products, some do not. The challenge is to find a toy your child will love and one that you know is safe.

How do I select a safe toy?

- Avoid toys that shoot or include parts that fly off. Slingshots and even water guns are dangerous because they invite children to target other kids. BB guns should not even be considered toys.
- Inspect toys for solidness. Your child's toys should be durable with no sharp edges or points. The toys should also withstand impact.
- Look for the letters "ASTM." This means the product meets the national safety standards set by the American Society for Testing and Materials (ASTM).

What should I consider when buying toys for 2 and 4-year-olds?

- Don't give toys with small parts to young children. Young kids tend to put things in their mouths, increasing the risk of choking.
- Read directions carefully and follow suggested age levels. Ask yourself if the toy is right for your child's ability and age.

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- Remember that age labeling is for abilty levels and for the safety of your child.

How can I keep my child safe after buying a toy?

- Explain how to use the toy.
- Repair or throw away damaged toys.
- Keep toys meant for older children away from younger ones.
- Don't let your child misuse toys in ways that could be dangerous.

Are there other things I can do to help prevent eye injuries?

- Store or give away toys that your child has outgrown.

Keep your child away from unsafe areas in the home. Make sure your child plays in an open area and, if necessary, under your supervision. Make a list of safety rules and share them with your child. If your child is playing with friends, tell everyone your safety rules.

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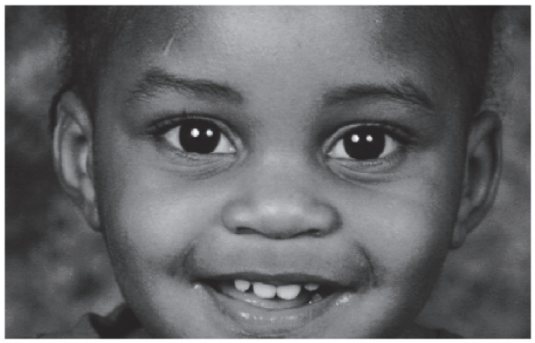

Facts About Fireworks Injuries

Prevent Blindness America wants all Americans to know the dangers of consumer fireworks. The U.S. Consumer Product Safety Commission reports the following fireworks injury statistics:

- Fireworks devices were involved in an estimated 9,200 injuries treated in U.S. hospital emergency rooms in 2006 (the latest year for which data is available).
- An estimated 6,400 injuries were treated in hospital emergency rooms during the one-month period (June 16-July 16) surrounding the Fourth of July.
- Eyes were the second most commonly injured part of the body, with an estimated 1,500 fireworks-related eye injuries treated in the same one-month period of 2006.
- Firecrackers accounted for 20% of all injuries followed by rockets (13%), and sparklers (16%).
- Males suffered three times the number of injuries as females.
- Sparklers caused the greatest number of injuries in children 14 and younger, followed by firecrackers and rockets.
- Of the 1,000 estimated sparkler injuries, 200 were to children age 5 and younger.
- 2,300 of the injuries were to children under age 15.
- Data from the U.S. Eye Injury Registry shows that bystanders are more often injured by fireworks than operators themselves.
- Contusions, lacerations and foreign bodies were the most common injuries to eyes.
- 11 people were killed by fireworks in 2006.
- Staff estimated that there were 100 emergency department-treated injuries at public fireworks displays.

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Keep These Fireworks-Related Injuries in Mind

- A 11-year-old boy was struck in the eye by a bottle rocket traveling hortizontally. He has permanent vision loss.
- A 12-year-old boy was treated for a burn to the eye after debris from a professional fireworks display (launched from a boat) flew into the victim's eye.
- A 12-year-old girl suffered a corneal abrasion when her sister lit a bottle rocket that tipped over and launched into the victim's eye.
- A 13-year-old boy lit a Roman candle in the back of his father's truck. Sparks got in his eye and he required emergency treatment.
- A 26-year-old male received burns to his eyes and face after he lit a mortar shell that immediately exploded.
- A 48-year-old male was watching people setting off fireworks when some debris from those fireworks got into his eye. He required emergency treatment.

Source: Green M.A., Joholske, J., 2006 Fireworks Annual Report: Fireworks-Related Deaths, Emergency Department Treated Injuries, and Enforcement Activities During 2006. U.S. Consumer Product Safety Commission, June, 2007.

Our Position: Protect Your Sight by Celebrating Safely

Prevent Blindness America urges you to celebrate safely. Fireworks are extremely dangerous. Do not purchase, use or store fireworks of any type. Protect yourself, your family and your friends by avoiding fireworks. Attend only authorized public fireworks displays conducted by licensed operators, but be aware that even professional displays can be dangerous.

Call our toll-free hotline at 1-800-331-2020 to receive *Safe Summer Celebrations*. The booklet discusses the dangers of fireworks and offers safe alternatives. You can also request a copy of our *Fireworks Eye Injury Safety Quiz*.

Prevent Blindness America supports the development and enforcement of bans on the importation, sale and use of all fireworks, except those used in authorized public displays by licensed operators, as the only effective means of eliminating the social and economic impact of fireworks-related trauma and damage. For more on Prevent Blindness America's position on fireworks, request a copy of our complete position statement.

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Fireworks Eye Injury Safety Quiz

There is no safe way to play with fireworks. If one of your children was hit in the eye, would you know what to do?

1. **Glass or metal from a bottle rocket strikes a child's eye. There is no bleeding, and the pain goes away quickly.**
   a. Ignore it. There is nothing wrong.
   b. Apply ointment or rinse out the eye.
   c. Take the child to the emergency room.
   d. Give aspirin or ibuprofen pain reliever.

2. **After an accident, the child is in terrible pain and wants to rub the eye. What should you do?**
   a. Let the child rub the eye.
   b. Do not let the child rub the eye and go immediately to the emergency room.
   c. Give aspirin or an ibuprofen pain reliever as soon as possible.
   d. Apply ointment right away.

3. **The child's eye has been hit by an exploding bottle rocket, a sparkler or another type of fireworks device. First:**
   a. Tape or secure some type of protective patch against the bones around the eye area and go immediately to the emergency room.
   b. Apply ointment right away.
   c. Rinse out the eye right away.
   d. Give a pain reliever like aspirin or ibuprofen.

4. **What is the best pain reliever to give to the child on the way to the hospital?**
   a. Child-dosage aspirin.
   b. Adult-dosage aspirin.
   c. An ibuprofen-based pain reliever.
   d. Do not stop for pain relief medication.

5. **Which of these is the <u>wrong</u> thing to do for a child's injured eye?**
   a. Apply ointment.
   b. Keep the child calm.
   c. Tape a patch against the bones surrounding the eye.

6. **Your child's friends are going to set off fireworks, and your child wants to play too. You:**
   a. Remember that bottle rockets can stray off course or throw shrapnel when they explode.
   b. Keep in mind that about half of fireworks injuries happen to bystanders.
   c. Insist that the child avoid fireworks and take him or her to a professional fireworks display.

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ANSWERS

1. ***c. Get the child to the emergency room.***
   An impact injury, caused by something slamming into the eye, can lead to damage that your child cannot immediately feel and you cannot see. Vision loss, even blindness, could occur within hours or days. Only an eye doctor's examination of the interior eye can reveal the result of an impact injury.

2. ***b. Do not let the child rub the eye.***
   Rubbing the eye may increase bleeding or worsen the injury.

3. ***a. Tape or hold a protective shield against the bones surrounding the eye.***
   Do not apply pressure to the eye itself. Using a foam cup or the bottom of a paper juice carton are just two tips. Protecting the eye from further contact with any item, including the child's hand, is the goal.

4. ***d. Don't stop for medication.***
   Over-the-counter pain relievers will not do much to alleviate pain. Aspirin (which should never be given to children) or ibuprofen can thin the blood, increasing bleeding. Take the child to an emergency room right away; this is more important than stopping for a pain reliever.

5. ***a. Apply ointment.***
   Ointment makes the area around the eye slippery and harder for the doctor to examine. Ointment may also not be sterile.

6. **a-c.** ***All of the answers are correct.***

Why You Should Leave Fireworks to the Professionals

Fireworks are extremely dangerous! Do not buy, use or store fireworks of any type. Protect yourself, your family and your friends by avoiding fireworks. Attend only authorized public fireworks displays conducted by licensed operators, but be aware that even professional displays can be dangerous.

- Bystanders often suffer. Data from the U.S. Eye Injury Registry shows that bystanders are more often injured by fireworks than professional operators.
- Sparklers burn at up to 1800 degrees Fahrenheit and are a leading cause of fireworks-related injuries, especially in young children.
- Bottle rockets are unpredictable. Their flight path is erratic, their fuses are non-standard and their explosive power is enough to turn the "launch site" bottle or can into shrapnel.
- Fireworks can explode in the hand, throw sparks into the face, cast hot fragments onto limbs and ignite clothing. Sparklers waved around or tossed in the air are a danger to children and bystanders.
- According to the U.S. Consumer Product Safety Commission, in 2006, an estimated 6,400 injuries were treated in hospital emergency rooms during the one month period surrounding the Fourth of July (June 16-July 16).
- Eyes were the second most commonly injured part of the body with an estimated 1,500 fireworks-related eye injuries treated in 2006.

CALL THE PREVENT BLINDNESS AMERICA VISION HEALTH RESOURCE CENTER AT

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TRICK-OR-TREAT—TIPS FOR MAKING HALLOWEEN SAFE

Halloween should be a fun time that your child remembers for years to come. Every year, there are several hundred eye injuries related to costumes and masks treated in U.S. hospital emergency rooms. There are many things you can do to ensure your child enjoys a safe Halloween and prevent a night of treats from turning into a night of tragedy.

Costumes, Safety

- Avoid costumes with masks, wigs, floppy hats or eye patches that block vision.
- Tie hats and scarves securely so they don't slip over children's eyes.
- Avoid costumes that drag on the ground to prevent tripping or falling.
- Avoid pointed props such as spears, swords or wands that may harm other children's eyes.
- Wear bright, reflective clothing or decorate costumes and bags with reflective tape/patches.
- Carry a bright flashlight to improve visibility.
- Do not ride a bike/scooter/skateboard or roller blade while wearing a costume.
- Obey all traffic signals—pedestrian and driver.
- Younger children should go with an adult while trick-or-treating around the neighborhood. Older children should trick-or-treat in groups.
- Use common sense. Never dart out between parked cars or hidden corners such as alleys. Avoid streets under construction. Don't trick-or-treat in busy commercial areas or where there is heavy traffic.

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- Go trick-or-treating in daylight, as it is safer than going after dark.
- A safer option is to go to a Halloween party instead of trick-or-treating.

Cosmetics, Contacts Lenses

- Wear hypoallergenic make-up. Have an adult apply the make-up and remove it with cold cream instead of soap. Use make-up in place of masks.
- Cosmetic contacts that make your eyes look like cat's eyes may seem like fun, especially at Halloween. However, these lenses come with the same risks as regular contact lenses. This growing fad may seem harmless, but it is not!
- Improper use of cosmetic lenses can lead to serious eye complications. These problems include bacterial infections, swelling, eye pain, sensitivity to light, conjunctivitis (pink eye), corneal scratches, corneal ulceration, and even permanent loss of sight.
- Never buy cosmetic contacts without a prescription! Never share your cosmetic contacts with others or use someone else's contacts.
- Since this fad is popular among teens, be vigilant about older kids' appearance before letting them leave the house. If they are wearing these contacts, ask where they got them.

Treats

- Inspect all trick-or-treat items for signs of tampering before allowing children to eat them.
- Carefully inspect any toys or novelty items received by kids age 3 and younger. These may pose a choking hazard. Avoid giving young kids lolly pops as the sticks can cause eye injuries.

Decorations

- Be sure your lawn, steps, porch and front door are well lit and free from obstacles.
- Keep candles and jack-o'-lanterns away from steps and porches outside, as costumes could brush against them and ignite. Inside, keep them away from curtains and other decorations to avoid causing a fire.

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Selecting Sunglasses For Children

The sun emits many types of rays, including visible light, which lets you see; infrared radiation, invisible but felt as heat; and ultraviolet (UV) radiation, also invisible and often called the "sunburn" ray.

Mounting scientific evidence shows that exposure to UV rays can damage your eyes. The most immediate danger to children is photokeratitis, a painful type of corneal sunburn linked with the bright sunlight reflected off beaches and ski slopes. Long-term exposure can lead to cataracts (cloudiness of the lens), skin cancer around the eyelids and even macular degeneration.

Prevent Blindness America recommends that everyone, including children, protect their eyes from the sun's harmful rays. Sunglasses with UV protection can help boost the eyes' ability to filter out the damaging rays. But if the sunwear doesn't block UV rays, it may actually be more harmful to wear the sunglasses.

Sunglasses without UV protection shade the eyes from the bright sun, but cause the pupils to dilate, actually allowing in more harmful rays. The following guidelines may help you select sunglasses that are safe and appropriate for your child.

Shop for sunglasses that block 99% to 100% of both types of ultraviolet rays: UV-A and UV-B. Sunglasses should also eliminate glare and squinting. Be wary of labels that claim a product blocks harmful UV without specifying exactly what amount of UV rays they block.

Look at the lenses carefully for scratches, bubbles and distortions. Here's an easy test for non-prescription lenses: hold the glasses away from your eyes and look at a good horizontal or vertical line, such as a window frame. Look through the lenses and check if the line appears straight. If the line appears wavy, the glasses may actually make it more difficult to see (although some distortion

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may be seen with prescription lenses for corrective purposes). Flaws and distortion in the lenses may cause your child's eyes to work harder and result in squinting, blinking, tearing and possibly even slight headaches.

Check the sunglasses periodically to make sure they fit well and are not damaged. Children often don't complain about their vision even when there is a problem. A regular check of their glasses is a good idea.

Select sunglasses that suit children's active lifestyles. The glasses should be impact resistant, lenses should not pop out of the frames, and the frames should be bendable, unbreakable and/or have snap-on temples.

Check the label to ensure the lenses are made of polycarbonate, the most impact resistant material available. Children's sunglasses should never be made of glass (unless required by their eye doctor).

Polycarbonate lenses are the best choice for active children.

Have the child try on the sunglasses before making a purchase. The lenses should be large enough to shield the eyes from most angles (above, below and either side) and to block light that enters in around the frames. The sunglasses should also fit snugly against the bridge of the child's nose—again to reduce the amount of sunlight that enters the eyes.

Choose a wide-brimmed hat for your child to maximize protection. The hat can cut the amount of UV exposure in half.

The price for non-prescription sunglasses ranges from $2 to $50, or more for designer lenses. Fashion should be the last thing you think about when buying sunglasses. Look at the amount of UV protection, lens quality, and durability to assure that you buy the right sunglasses for your child.

For more on UV Rays, Call the PBA Vision Health Resource Center at 1-800-331-2020.

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Things to Know about Cosmetic Contacts

Cosmetic contact lenses, often called zero-power or plano lenses can make quite a fashion statement. But this particular fashion statement can have some serious health risks. The lenses have been bought without prescription at boutiques, beach shops, tattoo parlors, and other nonprofessional retail vendors. There have been many cases of teenagers who nearly lost their eyesight as a result of improper use of these lenses.

Teens seem to be the biggest fans of these lenses. They cite reasons from that they look really cool to that they want to look like their favorite rock star who wears them. However, many teens do not take necessary precautions with the lenses and that is why they develop eye problems.

Prevent Blindness America believes, along with other vision organizations, that these lenses must be classified as medical devices, under the Food and Drug Administration (FDA). The FDA had such a policy in place until April 2003, at which time they decided to reclassify cosmetic lenses as cosmetics.

Contacts are not Cosmetics

Classifying cosmetic contact lenses in the same category as eye shadow, mascara and lipstick does not make sense. While there are some risks associated with eye cosmetics, there are more health risks when you put a foreign object in your eye.

What are the risks?

Contact lenses are relatively safe, however, complications can occur. Problems such as eye pain, bacterial infections, and corneal ulcers are caused by improper use of lenses or solutions. These problems also arise when patients try to take short cuts like using lenses for a longer period of time than indicated, or not using adequate cleaning and soaking solutions.

Contact Lens Safety Tips

- Always visit a licensed eye care professional to be fitted for contact lenses.

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- Always wear contact lenses under the supervision of an eye care professional.
- Always clean and disinfect contact lenses according to instructions.
- Always store contact lenses properly in a clean storage case.
- Always use water-soluble cosmetics or those labeled safe for use with contact lenses. Do not apply skin creams or moisturizers too close to the eyes.
- Never buy contact lenses without a prescription.
- Never go to sleep while wearing cosmetic lenses.
- Never wear opaque lenses if you have any problems with night vision.
- Never share or trade your contact lenses with friends.
- Seek medical attention immediately if you experience any pain, irritation, redness, blurriness or visual changes.

To find out more about Prevent Blindness America's public policy initiatives, visit us online at www.preventblindness.org/advocacy.

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SAFE SUMMER CELEBRATIONS

Celebrating the Fourth of July should be fun and safe for the entire family. Unfortunately, consumer fireworks are not only dangerous enough to spoil the fun, they are dangerous enough to take lives. You can have a great time celebrating Independence Day if you remember to keep your eyes on safety!

To help keep your Fourth of July safe this year, Prevent Blindness America offers these safe suggestions.

Fireworks Free

You can ensure your children's safety by supervising their activities and their environment. Instead of worrying about what might be going on in your neighborhood, you can be what's going on in the neighborhood.

Host a Fourth of July party for your kids and their friends.

- Let your guests make the decorations. Kids make cute decorations from crepe paper, construction paper, stickers and glue. These will provide fun and make the party look festive. Local craft or hobby shops have the supplies and lots of good ideas.
- Kids love to help in the kitchen, so plan on food-creating activities. Decorate your own pizza, make fun desserts (blueberries, strawberries and whipped cream provide a basis for lots of fun, patriotic desserts), grill vegetables they've skewered themselves, etc. This plan has a bonus, as if kids help make it, they are more likely to eat it!
- Let the kids decorate T-shirts or hats with paint and decals that glow in the dark. When evening rolls around, their new night-bright clothes will be dry and ready to model.
- Take the kids to a professional fireworks show. Check your local paper for times and locations of displays in your area.
- Provide safe sounds and sparkles (see lists below).

Safe Sounds

Part of fireworks' attraction to children is the big noise that goes with them. Kids love making noise and there are lots of safe ways for them to do this.

- Step or sit on inflated balloons until they pop.
- Inflate small bags (lunch bags are a good size). Popping the bags makes a nice, loud "BANG".

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- Buy noisemakers from a party store. Different brands and types of noisemakers make many unique, and loud sounds.
- Bring out your old pots, pans and pie plates. The kitchen cacophony should be quite satisfying to the noise-making set.
- Horns, whistles, bells and cymbals will also serve as sound fun.

Safe Sparkles

The other attractive part of fireworks is the glitter. Here are some safe, fire-free tips.

- Glo-sticks, glo-ropes and glo-jewelry provide safe and fun ways to brighten an evening.
- Flashlights, plain or with filters made by wrapping the flashlight in colored cellophane, can light the night in fun, safe ways.
- Neon and glow-in-the-dark paint can provide both a fun afternoon project and a special evening display. Kids enjoy watching their art take on a special glow as the sky darkens.
- A jar of fireflies or lightening bugs can provide lots of fun. Nature's little sparklers provide a fun challenge to young insect hunters. Just remember to release the bugs before the hunters go to bed!
- Novelty flashlights can be extra fun. You can buy flashlights that have mirrors to bounce the light, and changeable colored filters or optic fibers that look like sparklers but are much safer.

Neighborhood Safety

While there are lots of advantages to hosting a party on Independence Day, it is important to remember that most fireworks accidents happen during the entire month surrounding the holiday.

- Explain to your children why you don't want them around non-professionals who are shooting off fireworks: Neighbor "Fred" may be a great guy, but he isn't a professional at pyrotechnics.
- "I wasn't going to shoot off anything, I was just going to watch." Because bystanders are more frequently injured than those doing the lighting, this isn't a good solution. Be sure your child knows that you don't want him/her anywhere around consumer fireworks.
- It is important that you discuss fireworks with your children. Be sure they understand how you expect them to act around consumer fireworks. A little role-playing may help give your child the confidence to say "No". There will be many times that your child will need to say no to friends and peers. Help him/her practice now.

Should the worst happen . . .

If a child's eye is injured in a fireworks accident, what should you do?

If there are specks in the eye...

- **DO NOT** rub the eye.
- Use an eye wash or let tears wash out the speck.
- Lift upper eyelid outward and down over the lower lid.
- If the speck doesn't wash out—keep the eye closed, bandage lightly and see a doctor.

Cuts and punctures of eye and eyelid...

- **DO NOT** wash out the eye with water.
- **DO NOT** try to remove an object stuck in the eye.
- Cover the eye with a rigid shield without pressure. The bottom half of a paper cup can be used. See doctor at once.

For more about Fireworks, Call the PBA Vision Health Resource Center at 1-800-331-2020.

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PAINTBALL POSITION STATEMENT

Paintball presents the potential for injury, particularly serious eye injury, including loss of sight, and/or loss of an eye.

Eye protection **MUST** be worn during **ALL** paintball activity.

Only use eye protection certified by the Protective Eyewear Certification Council as meeting or exceeding the requirements of the American Society of Testing and Materials ASTM F1776 – Standard Specification for Eye Protection Devices for Paintball.

The manufacturers and distributors of paintball equipment, and the owners and operators of commercial paintball facilities must follow appropriate safety standards.

Paintball activity should only be conducted in organized paintball facilities operated and supervised according to American Society of Testing and Materials ASTM F1777 – Standard Practice for Paintball Field Operation.

Paintball activity in unsupervised arenas, such as backyards and inside homes is strongly discouraged.

Paintball markers (air guns) should be treated with the same safety precautions as firearms. The marker should be placed on safe and barrel plugs should be used when exiting a playing field. The marker should be unloaded, de-gassed and locked in a storage unit when not in use.

Approval

This statement was written by the Community Programs Committee of Prevent Blindness America and approved by the Prevent Blindness America board of directors in March, 2002.

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Policy 8.0c/CJH/3-24-02

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Children's Eye Health Position Statement

Prevent Blindness America recommends a continuum of eye care for children to include both vision screening and comprehensive eye examinations. All children, even those with no signs of trouble, should have their eyes checked at regular intervals. Any child who experiences vision problems or shows symptoms of eye trouble should receive a comprehensive eye examination by an optometrist or an ophthalmologist.

Prevent Blindness America and other organizations often perform vision screenings for children at schools, daycare centers, and other settings. While vision screenings and eye examinations are complementary approaches to assessing the eye problems of a child, a screening is used to identify a child at risk for vision problems and does not replace a comprehensive examination performed by an eye doctor.

A comprehensive eye examination includes an evaluation of the refractive state, dilated fundus examination, visual acuity, ocular alignment, binocularity, and color vision testing, where appropriate.

Suggested timetables for children's eye health, based on key children's health organizations are:

- Newborn infants should have their eyes checked while still in the hospital nursery. This examination in the nursery should be for general eye health and include a red reflex test. This examination can help detect several congenital eye problems, some of which can be very serious and permanently threaten vision.
- During regular well baby exams, from birth to 2 years of age, pediatricians should use history and a vision evaluation to see if vision problems exist. Beginning at well child exams at age 3 and continuing through 10 years of age, vision screenings should be performed assessing visual acuity and ocular alignment.
- If a child fails a vision screening or there is any concern of an eye or vision problem the child should be referred for a comprehensive professional eye examination. This combination of primary care physician eye examinations and vision screenings with referral for a comprehensive professional eye examination are the recommendations of the American Academy of Pediatrics, the American Academy of Ophthalmology, and the American

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POLICY STATEMENT
Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of All Children

Eye Examination in Infants, Children, and Young Adults by Pediatricians

ABSTRACT. Early detection and prompt treatment of ocular disorders in children is important to avoid lifelong visual impairment. Examination of the eyes should be performed beginning in the newborn period and at all well-child visits. Newborns should be examined for ocular structural abnormalities, such as cataract, corneal opacity, and ptosis, which are known to result in visual problems. Vision assessment beginning at birth has been endorsed by the American Academy of Pediatrics, the American Association for Pediatric Ophthalmology and Strabismus, and the American Academy of Ophthalmology. All children who are found to have an ocular abnormality or who fail vision assessment should be referred to a pediatric ophthalmologist or an eye care specialist appropriately trained to treat pediatric patients.

INTRODUCTION

Eye examination and vision assessment are vital for the detection of conditions that result in blindness, signify serious systemic disease, lead to problems with school performance, or at worst, threaten the child's life. Through careful evaluation of the ocular system, retinal abnormalities, cataracts, glaucoma, retinoblastoma, strabismus, and neurologic disorders can be identified, and prompt treatment of these conditions can save a child's vision or even life. Examination of the eyes should be performed beginning in the newborn period and at all well-child visits. Visual acuity measurement should be performed at the earliest possible age that is practical (usually at approximately 3 years of age). Early detection and prompt treatment of ocular disorders in children is important to avoid lifelong permanent visual impairment.

TIMING OF EXAMINATION AND SCREENING

Children should have an assessment for eye problems in the newborn period and then at all subsequent routine health supervision visits. These should be age-appropriate evaluations as described in subsequent sections. Infants and children at high risk of eye problems should be referred for specialized eye examination by an ophthalmologist experienced in treating children. This includes children who are very premature; those with family histories of congenital cataracts, retinoblastoma, and metabolic or genetic diseases; those who have significant developmental delay or neurologic difficulties; and those with systemic disease associated with eye abnormalities. Because children do not complain of visual difficulties, visual acuity measurement (vision screening) is an important part of complete pediatric eye care and should begin at 3 years of age. To achieve the most accurate testing possible, the most sophisticated test that the child is capable of performing should be used (Table 1).[1,2] The frequency of examinations recommended is in accordance with the American Academy of Pediatrics "Recommendations for Preventive Pediatric Health Care."[2] Any child unable to be tested after 2 attempts or in whom an abnormality is suspected or detected should be referred for an initial eye evaluation by an ophthalmologist experienced in the care of children.

PROCEDURES FOR EYE EVALUATION

Eye evaluation in the physician's office should include the following:

Birth to 3 Years of Age

1. Ocular history
2. Vision assessment
3. External inspection of the eyes and lids
4. Ocular motility assessment
5. Pupil examination
6. Red reflex examination

3 Years and Older

1 through 6, plus:

7. Age-appropriate visual acuity measurement
8. Attempt at ophthalmoscopy

TABLE 1. Eye Examination Guidelines*

Ages 3–5 Years			
Function	Recommended Tests	Referral Criteria	Comments
Distance visual acuity	Snellen letters Snellen numbers Tumbling E HOTV Picture tests –Allen figures –LEA symbols	1. Fewer than 4 of 6 correct on 20-ft line with either eye tested at 10 ft monocularly (ie, less than 10/20 or 20/40) or 2. Two-line difference between eyes, even within the passing range (ie, 10/12.5 and 10/20 or 20/25 and 20/40)	1. Tests are listed in decreasing order of cognitive difficulty; the highest test that the child is capable of performing should be used; in general, the tumbling E or the HOTV test should be used for children 3–5 years of age and Snellen letters or numbers for children 6 years and older. 2. Testing distance of 10 ft is recommended for all visual acuity tests. 3. A line of figures is preferred over single figures. 4. The nontested eye should be covered by an occluder held by the examiner or by an adhesive occluder patch applied to eye; the examiner must ensure that it is not possible to peek with the nontested eye.
Ocular alignment	Cross cover test at 10 ft (3 m)	Any eye movement	Child must be fixing on a target while cross cover test is performed.
	Random dot E stereo test at 40 cm	Fewer than 4 of 6 correct	
	Simultaneous red reflex test (Bruckner test)	Any asymmetry of pupil color, size, brightness	Direct ophthalmoscope used to view both red reflexes simultaneously in a darkened room from 2 to 3 feet away; detects asymmetric refractive errors as well.
Ocular media clarity (cataracts, tumors, etc)	Red reflex	White pupil, dark spots, absent reflex	Direct ophthalmoscope, darkened room. View eyes separately at 12 to 18 inches; white reflex indicates possible retinoblastoma.
6 years and older			
Function	Recommended Tests	Referral Criteria	Comments
Distance visual acuity	Snellen letters Snellen numbers Tumbling E HOTV Picture tests -Allen figures -LEA symbols	1. Fewer than 4 of 6 correct on 15-ft line with either eye tested at 10 ft monocularly (ie, less than 10/15 or 20/30) or 2. Two-line difference between eyes, even within the passing range (ie, 10/10 and 10/15 or 20/20 and 20/30)	1. Tests are listed in decreasing order of cognitive difficulty; the highest test that the child is capable of performing should be used; in general, the tumbling E or the HOTV test should be used for children 3–5 years of age and Snellen letters or numbers for children 6 years and older. 2. Testing distance of 10 ft is recommended for all visual acuity tests. 3. A line of figures is preferred over single figures. 4. The nontested eye should be covered by an occluder held by the examiner or by an adhesive occluder patch applied to eye; the examiner must ensure that it is not possible to peek with the nontested eye.
Ocular alignment	Cross cover test at 10 ft (3 m)	Any eye movement	Child must be fixing on a target while cross cover test is performed.
	Random dot E stereo test at 40 cm	Fewer than 4 of 6 correct	
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Ocular media clarity (cataracts, tumors, etc)	Red reflex	White pupil, dark spots, absent reflex	Direct ophthalmoscope, darkened room. View eyes separately at 12 to 18 inches; white reflex indicates possible retinoblastoma.

* Assessing visual acuity (vision screening) represents one of the most sensitive techniques for the detection of eye abnormalities in children. The American Academy of Pediatrics Section on Ophthalmology, in cooperation with the American Association for Pediatric Ophthalmology and Strabismus and the American Academy of Ophthalmology, has developed these guidelines to be used by physicians, nurses, educational institutions, public health departments, and other professionals who perform vision evaluation services.

Ocular History

Parents' observations are valuable. Questions that can be asked include:

- Does your child seem to see well?
- Does your child hold objects close to his or her face when trying to focus?
- Do your child's eyes appear straight or do they seem to cross or drift or seem lazy?
- Do your child's eyes appear unusual?
- Do your child's eyelids droop or does 1 eyelid tend to close?
- Have your child's eye(s) ever been injured?

Relevant family histories regarding eye disorders or preschool or early childhood use of glasses in parents or siblings should be explored.

Vision Assessment

Age 0 to 3 Years

Vision assessment in children younger than 3 years or any nonverbal child is accomplished by evaluating the child's ability to fix and follow objects.[3,4] A standard assessment strategy is to determine whether each eye can fixate on an object, maintain fixation, and then follow the object into various gaze positions. Failure to perform these maneuvers indicates significant visual impairment. The assessment should be performed binocularly and then monocularly. If poor fix and following is noted binocularly after 3 months of age, a significant bilateral eye or brain abnormality is suspected, and referral for more formal vision assessment is advisable.[5] It is important to ensure that the child is awake and alert, because disinterest or poor cooperation can mimic a poor vision response.

Visual Acuity Measurement or Vision Screening (Older Than 3 Years)

Various tests are available to the pediatrician for measuring visual acuity in older children. Different picture tests, such as LH symbols (LEA symbols) and Allen cards, can be used for children 2 to 4 years of age. Tests for children older than 4 years include wall charts containing Snellen letters, Snellen numbers, the tumbling E test, and the HOTV test (a letter-matching test involving these 4 letters).[6] A study of 102 pediatric practices revealed that 53% use vision testing machines.[3] Because testing with these machines can be difficult for younger children (3–4 years of age), pediatricians should have picture cards and wall charts available.

Photoscreening

Using this technique, a photograph is produced by a calibrated camera under prescribed lighting conditions, which shows a red reflex in both pupils. A trained observer can identify ocular abnormalities by recognizing characteristic changes in the photographed pupillary reflex.[7] When performed properly, the technique is fast, efficient, reproducible, and highly reliable. Photoscreening is not a substitute for accurate visual acuity measurement but can provide significant information about the presence of sight-threatening conditions, such as strabismus, refractive errors, media opacities (cataract), and retinal abnormalities (retinoblastoma). Photoscreening techniques are still evolving. (For further information, see also the American Academy of Pediatrics policy statement, "Use of Photoscreening for Children's Vision Screening."[8])

External Examination (Lids/Orbit/Cornea/Iris)

External examination of the eye consists of a penlight evaluation of the lids, conjunctiva, sclera, cornea, and iris. Persistent discharge or tearing may be attributable to ocular infection, allergy, or glaucoma, but the most common cause is lacrimal duct obstruction. It often manifests during the first 3 months as persistent purulent discharge out of 1 or both eyes. Topical or oral antibiotics should be given, and lacrimal sac massage should be attempted. Because these same findings are often seen in congenital glaucoma, failure to promptly resolve after treatment or the presence of cloudy or asymmetrically enlarged corneas should prompt ophthalmologic referral for additional evaluation.

Unilateral ptosis can cause amblyopia by inducing astigmatism, even if the pupil is not occluded. Patients with this condition require ophthalmic evaluation. Bilateral ptosis may be associated with significant neurologic disease, such as myasthenia. Additional investigation by a child neurologist and pediatric ophthalmologist is warranted.

Ocular Motility

The assessment of ocular alignment in the preschool and early school-aged child is of considerable importance. The development of strabismus in children may occur at any age and can represent serious orbital, intraocular, or intracranial disease. The corneal reflex test, cross cover test, and random dot E stereo test are useful in differentiating true strabismus from pseudostrabismus (see Appendix 1). The most common cause of pseudostrabismus is prominent epicanthal lid folds that cover the medial portion of the sclera on both eyes, giving the impression of crossed eyes (esotropia). Detection of an eye muscle imbalance or inability to differentiate strabismus from pseudostrabismus necessitates a referral.

Pupils

The pupils should be equal, round, and reactive to light in both eyes. Slow or poorly reactive pupils may indicate significant retinal or optic nerve dysfunction. Asymmetry of pupil size, with 1 pupil larger than the other, can be attributable to a sympathetic disorder (Horner syndrome) or a parasympathetic abnormality (third nerve palsy, Adie syndrome). Small differences can occur normally and should be noted in the chart for reference in case of subsequent head injury. Larger pupil asymmetries (>1 mm) can be attributable to serious neurologic disorders and need additional investigation.

Red Reflex Test (Monocular and Binocular, Bruckner Test)

The red reflex test can be used to detect opacities in the visual axis, such as a cataract or corneal abnor-

mality, and abnormalities of the back of the eye, such as retinoblastoma or retinal detachment. When both eyes are viewed simultaneously, potentially amblyogenic conditions, such as asymmetric refractive errors and strabismus, also can be identified. The test should be performed in a darkened room (to maximize pupil dilation). The direct ophthalmoscope is focused on each pupil individually approximately 12 to 18 inches away from the eye, and then both eyes are viewed simultaneously at approximately 3 feet away. The red reflex seen in each eye individually should be bright reddish-yellow (or light gray in darkly pigmented, brown-eyed patients) and identical in both eyes. Dark spots in the red reflex, a blunted dull red reflex, lack of a red reflex, or presence of a white reflex are all indications for referral. After assessing each eye separately, the eyes are viewed together with the child focusing on the ophthalmoscope light (Bruckner test, see Appendix 1). As before, any asymmetry in color, brightness, or size is an indication for referral, because asymmetry may indicate an amblyogenic condition.

Visual Acuity Measurement (Vision Screening)

Visual acuity testing is recommended for all children starting at 3 years of age.[6] In the event that the child is unable to cooperate for vision testing, a second attempt should be made 4 to 6 months later. For children 4 years and older, the second attempt should be made in 1 month. Children who cannot be tested after repeated attempts should be referred to an ophthalmologist experienced in the care of children for an eye evaluation. Appendix 1 provides a detailed explanation of the techniques available for visual acuity measurement in children.

Ophthalmoscopy

Ophthalmoscopy may be possible in very cooperative 3- to 4-year-olds who are willing to fixate on a toy while the ophthalmoscope is used to evaluate the optic nerve and retinal vasculature in the posterior pole of the eye.

RECOMMENDATIONS

1. All pediatricians and other providers of health care to children should be familiar with the joint eye examination guidelines of the American Association for Pediatric Ophthalmology and Strabismus, the American Academy of Ophthalmology, and the American Academy of Pediatrics.
2. Every effort should be made to ensure that eye examinations are performed using appropriate testing conditions, instruments, and techniques.
3. Newborns should be evaluated for ocular structural abnormalities, such as cataract, corneal opacities, and ptosis, which are known to result in vision problems, and all children should have their eyes examined on a regular basis.[1]
4. The results of vision assessments, visual acuity measurements, and eye evaluations, along with instructions for follow-up care, should be clearly communicated to parents.[2]
5. All children who are found to have an ocular abnormality or who fail vision screening should be referred to a pediatric ophthalmologist or an eye care specialist appropriately trained to treat pediatric patients.

APPENDIX 1. TESTING PROCEDURES FOR ASSESSING VISUAL ACUITY

The child should be comfortable and in good health at the time of the examination. It is often convenient to have younger children sit on a parent's lap. If possible, some preparation before the actual testing situation is helpful, and parents can assist by demonstrating the anticipated testing procedures for their child. Children who have eyeglasses generally should have their vision tested while wearing the eyeglasses. Eyeglasses prescribed for use only

while reading should not be worn when distance acuity is being tested.

Consideration must be given to obtaining good occlusion of the untested eye; cardboard and paddle occluders have been found inadequate for covering the eye because they allow "peeking." Commercially available occluder patches provide complete occlusion necessary for appropriate testing.[1] Vision testing should be performed at 10 feet (except Allen cards) and in a well-lit area. When ordering wall charts, be sure to indicate that a 10-foot testing distance will be used.

Visual Acuity Tests

Snellen Acuity Chart

When performing visual acuity testing, test the child's right eye first by covering the left. A child who has corrective eyeglasses should be screened wearing the eyeglasses. Tell the child to keep both eyes open during testing. If the child fails the practice line, move up the chart to the next larger line. If the child fails this line, continue up the chart until a line is found that the child can pass. Then move down the chart again until the child fails to read a line. After the child has correctly identified 2 symbols on the 10/25 line, move to the critical line (10/20 or 20/40 equivalent). To pass a line, a child must identify at least 4 of the 6 symbols on the line correctly. Repeat the above procedure covering the right eye.

Tumbling E

For children who may be unable to perform vision testing by letters and numbers, the tumbling E or HOTV test may be used. Literature is available from the American Academy of Ophthalmology (*Home Eye Test*, American Academy of Ophthalmology, PO Box 7424, San Francisco, CA 94109, 415/561-8500 or http://www.aao.org) and Prevent Blindness America (*Preschoolers Home Eye Test*, Prevent Blindness America, 500 East Remington Rd, Schaumburg, IL 60173, 847/843-2020 or http://www.preventblindness.com) for home use by parents to prepare children for the tumbling E test. This literature contains the practice Es, a tumbling E wall chart, and specific instructions for parents.

HOTV Test (Matching Test)

An excellent test for children who are unable to perform vision testing by verbally identifying letters and numbers is the HOTV matching test. This test consists of a wall chart composed only of Hs, Os, Ts, and Vs. The child is provided an 8½ × 11-inch board containing a large H, O, T, and V. The examiner points to a letter on the wall chart, and the child points to (matches) the correct letter on the testing board. This can be especially useful in the 3- to 5-year-old who is unfamiliar with the alphabet.

Allen Cards

The Allen card test consists of 4 flash cards containing 7 schematic figures: a truck, house, birthday cake, bear, telephone, horse, and tree. When viewed at 20 feet, these figures represent 20/30 vision. It is important that a child identify verbally or by matching all 7 pictures before actual visual testing. Testing should only be performed with the figures that the child readily identified. Perform initial testing with the child having both eyes open, viewing the cards at 2 to 3 feet away. Present 1 or 2 figures to ensure that the child understands the testing procedure. Then begin walking backward 2 to 3 feet at a time, presenting different pictures to the child. Continue to move backward as long as the child directly calls out the figures presented. When the child begins to miss the figures, move forward several feet to confirm that the child is able to identify the figures at the shorter distance. To calculate an acuity score, the furthest distance at which the child is able to identify the pictures accurately is the numerator and 30 is the denominator. Therefore, if a child were able to identify pictures accurately at 15 feet, the visual acuity would be recorded as 15/30. This is equivalent to 30/60, 20/40, or 10/20. To perform this test in the same way as for HOTV testing, a "matching panel" of all of the Allen figures may be prepared on a copy machine.

LH Symbols (LEA Symbols)

The LH symbol test is slightly different from the Allen card test in that it is made up of flash cards held together by a spiral binding. The flash cards contain large examples of a house, apple, circle, and square; these should be presented to the child before formal vision testing to see if they can be correctly identified. Unlike the Allen cards, the LH symbol test contains flash cards with more than 1 figure per card and with smaller figure sizes so that testing may be performed at 10 feet. Recorded on each card is the symbol size and visual acuity value for a 10-foot testing distance. The visual acuity is determined by the smallest symbols that the child is able to identify accurately at 10 feet. For example, if the child is able to identify the 10/15 symbol at 10 feet, the child's visual acuity is 10/15 or 20/30.

If it is not possible to perform testing at 10 feet, move closer to the child until he or she correctly identifies the largest symbol. At this point, proceed down in size to the smallest symbols the child is consistently able to correctly identify. The vision is recorded as the smallest symbol identified (bottom number) at the testing distance (top number). For example, correctly identifying the 10/15 symbols at 5 feet is recorded as 5/15 or 20/60. Likewise, identifying the 10/30 symbols at 2 feet is 2/30 or 20/300 (both the bottom and top numbers can be multiplied or divided by the same number to give an equivalent vision.) A "matching panel" is provided with the LH test and may be helpful in testing very young children. At least 3 of 4 figures should be identified for each size or distance.

Testing Procedures for Assessing Ocular Alignment

Corneal Light Reflex Test

A penlight may be used to evaluate light reflection from the cornea. The light is held approximately 2 feet in front of the face to have the child fixate on the light. The corneal light reflex (small white dot) should be present symmetrically and appear to be in the center of both pupils. A reflex that is off center in 1 eye may be an indication of an eye muscle imbalance. A slight nasal displacement of the reflex is normal, but a temporal displacement is almost never seen unless the child has a strabismus (esotropia).

Simultaneous Red Reflex Test (Bruckner Test)

This test can detect amblyogenic conditions, such as unequal refractive errors (unilateral high myopia, hyperopia, or astigmatism), as well as strabismus and cataracts. When both eyes are viewed simultaneously through the direct ophthalmoscope in a darkened room from a distance of approximately 2 to 3 feet with the child fixating on the ophthalmoscope light, the red reflexes seen from each eye should be equal in size, brightness, and color. If 1 reflex is different from the other (lighter, brighter, or bigger), there is a high likelihood that an amblyogenic condition exists. Any child with asymmetry should be referred for additional evaluation. Examples of normal and abnormal Bruckner test appearances are available from the AAP. "See Red" cards are available for purchase at http://www.aap.org/sections/ophthal.htm.

Cross Cover Test

To perform the cross cover test, have the child look straight ahead at an object 10 feet (3 meters) away. This could be an eye chart for older children or a colorful noise-making toy for younger children. As the child looks at a distant object, cover 1 eye with an occluder and look for movement of the uncovered eye. As an example, if the occluder is covering the left eye, movement is looked for in the uncovered right eye. This movement will occur immediately after the cover is placed in front of the left eye. If the right eye moves outward, the eye was deviated inward or esotropic. If the right eye moves inward, it was deviated outward or exotropic. After testing the right eye, test the left eye for movement in a similar manner. If there is no apparent misalignment of either eye, move the cover back and forth between the 2 eyes, waiting about 1 to 2 seconds between movements. If after moving the occluder, the uncovered eye moves in or out to take up fixation, a strabismus is present. Any movement in or out when shifting the cover indicates a strabismus is present, and a referral should be made to an ophthalmologist.

Random Dot E Stereo Test

The random dot E stereo test measures stereopsis. This is different from the light reflex test or the cover test, which detects physical misalignment of the eyes. Stereopsis can be absent in patients with straight eyes. An ophthalmologic evaluation is necessary to detect the causes of poor stereo vision with straight eyes. To perform the

random dot E stereo test, the cards should be held 16 inches from the child's eyes. Explain the test to the child. Show the child the gray side of the card that says "model" on it. Hold the model E in the direction at which the child can read it correctly. Have the child touch the model E to understand better that the picture will stand out. A child should be able to indicate which direction the legs are pointing. Place the stereo glasses on the child. If the child is wearing eyeglasses, place the stereo glasses over the child's glasses. Make sure the glasses stay on the child and the child is looking straight ahead. The child should be shown both the stereo blank card and the raised and recessed E card simultaneously. Hold each card so you can read the back. The blank card should be held so you can read it. The E card should be held so you can read the word "raised." Both cards must be held straight. Do not tilt the cards toward the floor or the ceiling—this will cause darkness and glare. Ask the child to look at both cards and to point to or touch the card with the picture of the E. The E must be presented randomly, switching from side to side. The child is shown the cards up to 6 times. To pass the test, a child must identify the E correctly in 4 of 6 attempts.

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All policy statements from the American Academy of Pediatrics automatically expire 5 years after publication unless reaffirmed, revised, or retired at or before that time.

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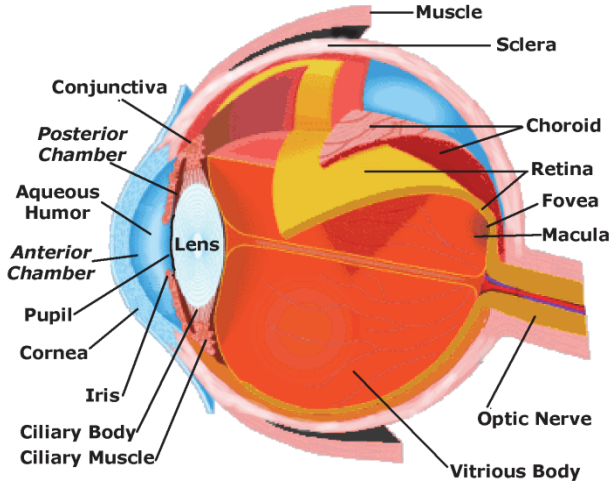
Glossary



A

Accommodation
Ability of the lens to adjust its shape using the eye's ciliary body for vision at various distances in order to produce a clear image on the retina.

Albinism
Congenital condition that results in partial or total deficiency in melanin pigment often occurring along with extreme sensitivity to light, involuntary eye movements, and visual impairments.

Amblyopia
Commonly referred to as "lazy eye." Reduced vision in the eye not adequately used, which causes a misalignment (crossing) or a difference in focusing between the eyes.

Anterior Chamber
Space in front portion of the eye between the cornea and the iris and lens, which is filled with aqueous humor.

Aqueous Humor
The water-like fluid filling the space behind the cornea and in front of the crystalline lens (the anterior chamber). It is produced by the ciliary body and drains back into the blood circulation through channels in the chamber angle. Its main function is to provide nutrients to the front portion of the eyeball.

Astigmatism
Irregular curvature of the cornea or lens resulting in a distorted image because light rays are not focused on a single point on the retina.

B

Binocular Vision
Coordinated use of the two eyes to see a single fused three-dimensional image.

Blind spot
In testing the visual field, this is the blind area corresponding to the optic disk where the optic nerve fibers exit the eye and where there are no light-sensitive cells.

Blindness
See legal blindness.

C

Cane
Device used to locate and navigate environmental objects (e.g., steps, curbs, streets, classrooms, people, chairs). The cane is long enough to be two steps ahead of the individual who is blind allowing him or her to find obstacles with the cane before getting to the obstacle.

Cataract
Opaque or clouding of the lens that blocks or changes the passage of light through the lens and result in blurry, hazy, or distorted vision. Cataracts can be present at birth or soon after (congenital cataract) or occur as the result of injury (traumatic cataract).

Central Field Loss
Loss of sight that results in difficulty seeing a vertical object presented at the midline of the body.

Central Visual Field
The area of objects in space seen without moving the head or eyes; corresponds to an area within 30 degrees of the fixation point (fovea)

Choroid
The middle layer of the eyeball's casing, positioned between
the sclera and retina. It contains blood vessels that supply most of the nourishment to the other parts of the eye, especially the retina.

Ciliary Body
The extension of the choroid, connecting with the iris; a ring of tissue between the iris and the choroids consisting of muscles and blood vessels that changes the shape of the lens and manufactures aqueous humor. The ciliary body is connected to the lens by fine fibers called zonules.

Congenital Color Deficiency (color blindness)
Inability to recognize certain colors, primarily red or green, but rarely blue.

Color Vision
Ability to distinguish colors and shades; occurs when the color-sensitive cone cells in the retina properly pick up and send normal color signals to the brain.

Cones
Cone-shaped nerve endings in the retina particularly in the macula area; cone function predominates in daylight with a small pupil allowing one to make out details and shapes, especially colors.

Congenital
Present at birth.

Conjunctiva
The delicate tissue or membrane lining the inside of the eyelids covering the front part of the eye except the cornea.

Conjunctivitis
Commonly referred to as “pink eye”; infection and inflammation of the conjunctiva, usually from an allergy, virus, or bacterium.

Cornea
The clear, dome-shaped “front window” of the eye. The cornea is a lens that bends (refracts) light rays as they pass through. The curvature of the cornea accomplishes about 80 percent of the focusing of the eye.

Cortical Blindness
Condition in which the structure of the eye is normal, but vision is affected as the result of damage to the visual center of the cerebral cortex.

Crystalline Lens
The transparent tissue that acts like a magnifying glass behind the pupil. The crystalline lens flexes when we want to look at something close-up, providing about 30 percent of the eye’s total focusing power. The growth and hardening of the lens causes it to lose its flexibility over time, which is why people 45 and older usually need bifocal contacts or glasses, or reading glasses.

D

Degeneration
Tissue changes that make it less able to do its function.

Depth Perception
The blending of slightly dissimilar images from the two eyes for the perception of three dimensional depth.

Diabetic Retinopathy
Changes in the retina due to diabetes, eventually leading to proliferative diabetic retinopathy. If the diabetes is not controlled, small blood vessels that nourish the retina weaken and become blocked or break down.

Diabetic Retinopathy-Proliferative
Formation of scar tissue on the surface of the retina (which can cause retinal tears and detachment) and leaking of blood by the new fragile vessels into the eye (vitreous hemorrhage), all capable of causing severe vision loss or blindness.

Diopter
Metric unit used to denote the refractive error of the eye or lens.

Distance Vision
Ability to distinctly perceive objects at a distance, usually 20 feet.

E

Extraocular Muscles
Consist of six separate muscles that control eye movement. Five of these muscles originate from the back of the orbit and wrap around the eye to attach within millimeters of the cornea. Four of these muscles move the eye roughly up, down, left, and right. Two of these muscles, one of which originates from the lower rim of the orbit, control the twisting motion of the eye when the head is tilted.

Exotropia
Turning outward of one or both eyes.
(See Strabismus for more.)

Esotropia
Turning inward of one or both eyes.
(See Strabismus for more.)

Eyelid
Serves multiple functions. Reflex closure of the eyelids will keep objects out of the eye and lubricate the cornea by distributing fresh tears. The eyelid also limits the light entering the eye.

Eye, The
A complete optical system slightly smaller than a ping-pong ball. The eye is an intricate arrangement of tissues, fluids, nerves, and cells that work together to transform light into the images that we see. Our eyes work as “live cameras” for the brain, gathering up and processing images.

F

Farsightedness (Hyperopia)
A refractive error in which the focal point for light rays is
behind the retina (also called hyperopia); distant objects are seen more clearly than near objects.

Focus
The point at which light rays meet after passing through the cornea and lens; in normal eyes this point is on the fovea of the retina.

Fovea
A small area of the retina composed predominately of cones and responsible for central vision and color vision.

G

Glaucoma
A progressive disease of the optic nerve resulting in a reduction in the visual field (beginning in the periphery and gradually moving inward) and even blindness; most significant risk factor is elevated intraocular pressure (IOP). Rare in infants and children.

H

Hemianopsia
Loss of either the right or left half of the visual field. Can result from a stroke and traumatic brain injury.

Hereditary
Appearing in, or characteristic of, successive generations; individual differences in human beings passed from parent to offspring.

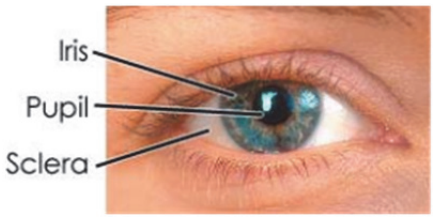
Hyperopia (Farsightedness)
See farsightedness.

I

Incidence
Number of new cases of a particular problem or disease that occurs within a period of time.

Intraocular Pressure (IOP)
The pressure within the eyeball that gives it a round firm shape, regulated by the rate at which aqueous humor enters and leaves the eye.

Iris
The doughnut-shaped ring of pigmented tissue in front of the lens that controls the size of the opening at its center. The iris opens and closes to regulate the amount of light entering the eye.



L

Legal Blindness
Central vision acuity does not exceed 20/200 in the better eye with correcting lens; field of vision no greater than 20 degrees in its widest angle; visual acuity of 20/200 means that a person can see at a distance of 20 feet that one with “normal” sight can see at 200 feet.

Lens (Crystalline Lens)
The transparent structure located immediately outside of the iris of the eye. Changes shape (flattens and thickens) to focus the incoming light from objects far away and near.

Low Vision
20/50 or less vision. Unable to perform basic visual tasks with conventional optical correction. Visual functioning can be increased through the use of optical aids and environmental modifications.

Low Vision Aids
Powerful optical devices useful to persons with a vision impairment that is not successfully corrected by the usual prescription lenses.

M

Macula
Rod free area in the middle of the retina responsible for distinguishing fine details and colors. At its center is the fovea, a tiny pit containing the highest concentration of cones and providing the ultimate focal point for the optical system.

Macula Lutea
Small yellowish area, slightly lateral to the center of the retina that is the region of maximum visual acuity and consists primarily of retinal cones.

Macular Degeneration (Juvenile or Age-Related)
Degenerative disease in which central vision is affected. The macula, the central portion of the retina, is progressively destroyed. Associated with arteriosclerosis, hereditary factors, or eye trauma.

Myopia (Nearsightedness)
See nearsightedness.

N

Nystagmus
Involuntary, rhythmical, repeated oscillations of one or both eyes, in any or all fields of gaze with reduced acuity caused by the inability to maintain steady fixation.

Nearsightedness (Myopia)
Also called myopia; a refractive error of the eye where the image of a distant object (more than 20 feet) is formed in front of the retina and cannot be seen distinctly; near objects are seen more clearly than distant objects.

Near Vision
The ability to perceive objects distinctly at normal reading distance (usually about 14 inches from the eye).

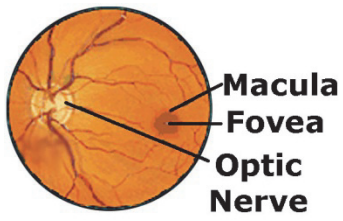
Night Blindness
Condition in which sight is good by day but deficient at night and in any faint light.

O

Ocular Mobility
Functioning of the eye muscles that enable the eyes to move together in all directions.

Ophthalmologist
A physician (doctor of medicine or doctor of osteopathy) who specializes in the comprehensive care of the eyes and visual system in the prevention of eye injury and disease. The ophthalmologist has completed four or more years of college premedical education, four or more years of medical school, one year of internship and three or more years of specialized medical and surgical training and experience in eye care. The ophthalmologist is a physician who is qualified by lengthy medical education, training, and experience to diagnose, treat and manage all eye and visual system problems and is licensed by a state board to practice medicine and surgery. The ophthalmologist is the medically trained specialist who can deliver total eye care: primary, secondary, and tertiary care services and diagnose general diseases of the body.

Optic Atrophy
Deterioration of the optic nerve causing severe vision loss and even blindness.



Optic Disk
Head of optic nerve; formed by the meeting of all retinal nerve fibers in the retina.

Optic Nerve
Special nerve of sight beginning in the retina as the optic disk. Contains visual information from the eye and has 1.2 million nerve fibers that carry impulses from the rods and cones of the retina to the brain resulting in visual images. The sheath around the optic nerve is continuous with that of the brain and the nerve connects directly into the brain.

Optician
Professionals in the field of designing, finishing, fitting, and dispensing of eyeglasses and contact lenses, based on an eye doctor ’s prescription. The optician may also dispense colored and specialty lenses for particular needs as well as low-vision aids and artificial eyes.

Optometrist
Health care professional trained and state licensed to provide primary eye care services. These services include comprehensive eye health and vision examinations; diagnosis and treatment of eye diseases and vision disorders; the prescribing of glasses and contact lenses, low vision rehabilitation, vision therapy and medications; the performing of certain surgical procedures; and the counseling of patients regarding their surgical alternatives and vision needs as related to their occupations, avocations, and lifestyle. The optometrist has completed pre-professional undergraduate education in a college or university and four years of professional education at the college of optometry, leading to the doctor of optometry degree.

P

Partially sighted
Central vision acuity is between 20/70 and 20/200 in the better eye with correction.

Peripheral Vision
The ability to perceive the presence of motion or the color of objects outside the direct line of vision.

Photoreceptors
Light-sensitive cells (cones and rods) in the retina that react to the specific wavelengths of light and prompt nerve impulses.

Presbyopia
Decreased elasticity of the lens due to advancing years or old age, which moves the near point of vision farther from the eye so it is difficult to focus on near objects.

Prevalence
Total number of cases of a problem or disease in the population at a given time.

Pupil
The opening in the center of the iris that appears as a black dot. In dim light, the iris enlarges the pupil, increasing the amount of light entering the eye and improving vision. In bright light, the iris reduces the pupil's size to decrease entering light and avoid eye damage. The pupil looks black because it is very dark inside – that is, almost no light is reflected back out.

Pupil Constriction
Decrease in the size of the pupil due to an increase in incoming light or an increase in lens accommodation.

Pupil Dilation or Dilatation
Increase in the size of the pupil due to a decrease in incoming light or a decrease in lens accommodation.

R

Refraction
Measurement of the eye to determine refractive errors and the need for prescription glasses.

Retina
Innermost layer of the eye containing light-sensitive nerve cells and fibers that connect with the brain through the optic nerve and are nourished by a network of blood vessels. The retina contains receptor cells called rods and cones that convert light into electrochemical impulses sent to the brain. Rods aid vision in dim light, while cones help with color perception.

Retinal Blood Vessels
Supply oxygen to the inner lining of the eye (retina).

Retinal Detachment (RD)
Retina separates from the pigment layer as a result of trauma to the eye, aging, or inflammation of the interior of the eye.

Retinitis Pigmentosa
Inherited, bilateral deterioration of the retina beginning in childhood and progressing through middle age. Manifested by night blindness and gradual loss of peripheral vision, eventually resulting in tunnel vision or total blindness.

Retinopathy
Any diseased condition of the retina, principally one that is non-inflammatory.

Retinopathy of Prematurity
Changes in the blood vessels of the eye's retina that occur soon after birth in some premature infants.

Rods
Light sensitive nerve endings in the retina that work best in darkness or dim illuminations.

S

Sclera
The "white of the eye." Along with the cornea, it forms a tough protective coating. The sclera continues back over the optic nerve to join with the outer covering of the brain.

Severe Visual Impairment
Inability to read ordinary newspaper print even with the aid of glasses, and impairment indicating no useful vision in either eye; includes those who are legally blind.

Strabismus
Vision impairment that prevents an individual from maintaining proper eye position. The individual experiences an inability to attain or maintain binocular vision due to a muscle imbalance in one eye, causing that eye to turn inward, outward, upward, or downward.

T

20/20 Vision
The ability to correctly perceive an object or letter of a designated size from a distance of 20 feet; normal visual acuity.

Tunnel Vision
Constriction of the visual field, resulting in the loss of peripheral vision.

U

Usher's Syndrome
A dual sensory condition. Hearing loss at birth and progressive visual loss from retinitis pigmentosa beginning by age 10.

V

Vitreous Humor
The clear, jelly-like substance filling the otherwise empty space behind the crystalline lens. It serves primarily to keep the retina pressed against the inside wall of the eyeball. It tends to liquefy with age.

Visual Acuity
Measurement of the ability of the eye to perceive the shape

of objects in the direct line of vision and to distinguish detail; generally determined by finding the smallest symbol on an eye chart that can be recognized.

Visual Cortex
The sensory area of the occipital lobe of the brain's cerebral cortex and concerned with the sense of sight.

Visual Field
The area in which objects are visible to the eye at a given instant without moving the eyes. Normally an arc of 150 degrees from right to left and 120 degrees up and down.

Visual Impairment
A generic term, which refers to a wide range of visual problems; difficulty seeing with one or both eyes even when wearing glasses.

Visual Pathway
The path of electrical impulses from the eye to the brain, resulting in the sense of vision.

Vitreous Body
Transparent colorless mass of soft, gelatinous material filling the globe of the eye between the lens and the retina.

Vitreous Humor
The transparent mass occupying the posterior compartment (the space between the crystalline lens and the retina of the eyes).

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http://www.amd.org
Contact: Judith Delgado
E-mail: judith.delgado@cshs.org

National Association for Parents of Children with Visual Impairments
P.O. Box 317
Watertown, MA 02471
Toll-free: 1-800-562-6265
Phone: (617) 972-7441
Fax: (617) 972-7444
http://www.spedex.com/napvi

National Association for the Visually Handicapped
22 West 21st Street
New York, NY 10010
Phone: (212) 889-3141 or 212-255-2804
Fax: (212) 727-2931
http://www.navh.org
E-mail: staff@navh.org

3201 Balboa Street
San Francisco, CA 94121
Phone: (415) 221-3201
Fax: (415) 221-8754
E-mail: staff@navh.org

National Diabetes Education Program, National Institutes of Health/Centers for Disease Control and Prevention
National Institutes of Health/Centers for Disease Control and Prevention
Building 31, Room 9A04
31 Center Drive
Bethesda, MD 20892
Phone: (301) 496-6110
Fax: (301) 496-7422
http://ndep.nih.gov

National Eye Institute (NEI)
31 Center Drive MSC 2510
Bethesda, MD 20892-2510
Phone: (301) 496-5248
http://www.nei.nih.gov
Contact: Rosemary Janiszewski

E-mail: rjaniszewski@nei.nih.gov
Opticians Association of America
441 Carlisle Drive
Herndon, VA 20170
Phone: (703) 437-8780
Fax: (703-437-0727
E-mail: oaa@oaa.org

Prevent Blindness America
211 W. Wacker Drive
Chicago, IL, 60601
Tel: (800) 331-2020
Fax: (847) 843-8458
http://www.preventblindness.org
E-mail: info@preventblindness.org

Sight & Hearing Association
674 Transfer Road
St. Paul, MN 55114-1402
Tel: (651) 645-2546, ext. 12
http://www.sightandhearing.org
Contact: Julee Sylvester
E-mail: jlps@sightandhearing.org

VISTAKON, Division of Johnson & Johnson Vision Care, Inc.
7500 Centurion Parkway
Jacksonville, FL 32256
Telephone: (904) 443-1829
Toll Free: 1-800-876-6622
http://www.acuvue.com
Contact: Stan Yamane
E-mail: syamane@visus.jnj.com

VSP (Vision Service Plan)
Vision Service Plan
3333 Quality Drive
Rancho Cordova, CA 95670
(916) 463-7221
(916) 463-7591 Fax
http://www.vsp.com
Contact: Pam Lapinski
E-mail: pamla@vsp.com

For descriptions of each organization see:
http://www.healthyvision2010.org/about_hv/c_members.asp

Evaluation Form

Your comments about this eye health and safety curriculum are very important to us. Please take a moment to complete this evaluation and mail it to Prevent Blindness Ohio, 1500 West Third Avenue, Suite 200, Columbus, OH 43212-2874. Thank you.

What grade level and how many students participated in the program?

Grade: K 1 2 3 4 5 6

Number of Students:

Were the materials in this program appropriate for the grade level?
Yes No

Please rate the following on a 5-point scale, “1” being very valuable and “5” not valuable.

	Very Valuable	Valuable	Somewhat Valuable	Minimal Value	Not Valuable	N/A
	1	2	3	4	5	
Lesson 1: The Gift of Sight						
Lesson 2: The Eye and How We See						
Lesson 3: Glasses, Why Some People Need Them						
Lesson 4: A World Without Sight						
Lesson 5: Taking Care of Our Eyes						
Activities						
Pre and Post Tests						
Supplemental Information						
Resources						
Overall Program						

Additional comments: _____
_____

_____

_____

_____

_____

Suggestions for improvement: _____
_____

_____

_____

_____

_____

Inclusion of your contact information is optional. However, if you complete the contact information we will send you a special gift to express our thanks for your input.

Name: _____
School/Organization: _____
Street Address: _____
City/State/Zip: _____
Work Phone: _____
Alternate Phone: _____
Email Address: _____

This certifies that

_____

has successfully participated in ***Play It Safe With Your Eyes!***

_____ _____

Teacher Date

Prevent Blindness America®
Our Vision Is Vision™